

Annals

of the

Missouri Botanical Garden

Vol. 45

NOVEMBER, 1958

No. 4

SYNTHYRIS RANUNCULINA

F. W. WENT

On recent trips to the Charleston Mountains in Southern Nevada I found a plant which I could not possibly identify nor even tentatively assign to a family.

The plant is an herb, growing at about 3,000 m. altitude in moist places; it has a short perennial stem with leaves placed in a rosette. The leaves are round in outline, reniform, with lobed margin, and the whole habit very much resembles *Heuchera rubescens*, which is a common plant at the same altitude in the Charleston area. There are one or two inflorescences per rosette, shorter or slightly longer than the leaves; the peduncle is scapose and carries a short ear-like inflorescence. The flower buds are enclosed between the green bracts, which close tightly into an almost globose structure. Each bract carries an almost sessile flower, which has 2 sepals which are slightly united at the base. The 3 light-blue strap-shaped petals are entirely separate; between the single wider abaxial and the two adaxial petals 2 stamens are inserted, and the ovary is two-celled with one style. The fruit is two-valved, with several seeds per locule, and resembles that of *Veronica*.

This latter fact should have made me look among the Schrophulariaceae, but neither the habit, nor the structure of the inflorescence, nor the flower structure, made this a likely family. Looking through the figures in Abrams' Illustrated Flora of the Pacific States, several species of *Synthyris* were found to have the habit, inflorescence and fruit characteristics of the Charleston Mountains plant, which, it turned out, had been described by Pennell (1933) as *Synthyris ranunculina*. He had seen only fruiting material (the plant occurs in areas covered until June or July with snow, apparently flowers immediately after the snow melts, and toward the end of July or in August, when most collecting is done, has only fruits) and thus had not noticed that the flower structure of this plant differs radically from the other described *Synthyris* species. They are supposed to have 4 calyx lobes, a corolla tube with 4 lobes, 2 stamens and 2 carpels.

Since the Charleston Mountain *Synthyris* differed so extensively in flower characters from the description of this genus, I inspected specimens of all *Synthyris* species described, which I found in the herbarium of the Philadelphia Academy of

Sciences (my thanks are due to Dr. Smith who helped me and who had photographs prepared of all species). It became immediately clear that although *Synthyris ranunculina* differs radically in its flower morphology from the better-known species, there are species with intermediate flower characters, in that *S. stellata* and *S. laciniata* both have only 3 corolla lobes. This poses interesting evolutionary problems, since *S. ranunculina* occurs at the extreme edge of the area of distribution of *Synthyris*, and the nearest species in habit, in flower characters, and in geographical distribution is *S. laciniata* from Southwestern Utah.

To see the evolutionary history of *Synthyris ranunculina* in perspective, I shall briefly summarize Pennell's revision (1933) of the genera *Synthyris* and *Besseyia*.

Synthyris and *Besseyia* are certainly closely related to *Veronica*, a Scrophulariaceae. Typically they have, like *Veronica*, only two stamens, inserted at the base of a short tubular or rotate blue corolla, with a flattened two-valved capsule. The main difference from *Veronica* lies in their vegetative development: on a short upright rootstock the long-petioled leaves are inserted close together, and the flowers are placed in axillary scapose inflorescences. Mostly they occupy moist places in sub-alpine, montane or arctic localities on the North American continent, resembling Saxifragaceae such as *Heuchera* and *Mitella* in habit and habitat.

Synthyris and *Besseyia* differ mainly in vegetative characters. The leaves of *Besseyia* are cordate and ovate or oblong with palmate venation. They are usually serrate, and the peduncles are more or less densely covered with sessile bract-like leaves. In *Synthyris* the leaves are cordate-reniform with palmate venation, and they are doubly crenate and more or less deeply cleft; the inflorescences are scapose, and the flowers in the ear-like spikes are subtended by bracts exceeding the flower in length.

Besseyia occurs in the Rocky Mountain region and further eastward, with one species (*B. rubra*) extending from Montana west to Eastern Washington and Oregon, and two (*B. arizonica* and *B. gooddingii*) extending into N.E. Arizona. It seems doubtful that the latter two species are distinct, and also *B. plantaginea* does not seem specifically separated from these two. In the genus *Besseyia*, which forms a natural group of species, an interesting reduction in flower parts occurs: Whereas 7 of the 9 species have a white, or light or dark purple corolla (presumably all with 4 lobes, of which the posterior one is enlarged to a lip), in the two species which extend most northwesterly (*B. rubra* and *B. cinerea*) the corolla is lacking. In the former the calyx is 4-lobed, but in *B. cinerea* this is reduced to 2 lobes.

As far as the flower characters is concerned, *Besseyia alpina*, through its purple flower color, and the relatively few bracts on the inflorescence (4-6), seems to be nearest the genus *Synthyris*, and occupies a central position in the distribution pattern of the genus, predominantly in Colorado in the alpine zone of the Central Rocky Mountains, with occurrences in S. Wyoming, N. New Mexico and E. Utah. A group of 5 species, which seem to differ only slightly from each other, mainly in not well-defined quantitative characters (apparent thickness of leaf blade, which in the specimens I have seen seems to be a function of the method of pressing the specimens; more or less elongated leaves; size of flowers, with overlapping ranges),

occurs to the South-West of the range of *Besseyia alpina*. Three of these are also alpine, occurring between 3000 and 4000 m. (*B. ritteriana*, *B. oblongifolia*, *B. gooddingii*), the other 2 species (*B. plantaginea* and *B. arizonica*) are montane (2000–3000 m.). In flower characters they seem to be very much alike.

From this core of *Besseyia* species the other three are clearly separated, both morphologically and in their distribution. *Besseyia bullii* has flowers like the preceding species, but has cordate-ovate, palmately veined leaves, which are densely hirsute. It extends from Minnesota and Iowa eastward to Ohio and Michigan, far outside the range of the other species of *Besseyia* and *Synthyris*, at low altitudes.

The leaves of *Besseyia cinerea* resemble most those of *B. bullii* in hairyness and shape, but it lacks a corolla and its calyx is 2-lobed. This species occurs in montane or alpine localities north of the range of *B. alpina*, from Nebraska and South Dakota to Idaho. The other corolla-less species, *Besseyia rubra*, occurs at low altitudes west of the range of *B. cinerea*.

The genus *Synthyris* is more varied and gives us more indications of evolution. In contrast to *Besseyia*, which has a very uniform leaf form in all species, leaves in *Synthyris* are of different shape, and there are more variations in flower structure, although reduction does not proceed as far as in *Besseyia* where the corolla is lacking in 2 species.

Synthyris reniformis occurs in forests at low altitude in western Oregon, mainly in the coastal ranges, extends into Washington and California; it flowers very early in the year with bright blue campanulate, short 4-lobed corollas. Its leaves are shaped like those of *Viola*, ovate or orbicular-cordate. This species stands apart from the others in the genus, also as regards seed characters (only 2 per locule, brown instead of yellowish in the other species).

The next two species are vegetatively very much alike, with large reniform leaves, both occurring on bluffs or cliffs on the border between Washington and Oregon, *S. schizantha* occurring in the coastal mountains, *S. stellata* along the Columbia river gorge. Their corollas are very different, however. In both the corolla tube is very short, but *S. schizantha* has 4 laciniate lobes like *S. platycarpa* from Idaho, with the lobes slit over more than half their length, and *S. stellata* has 3 entire lobes, the larger abaxial one obovate, the two lateral lobes strap-like. These three species seem to be most closely related to *S. missurica*, which has the widest range of distribution of any *Synthyris* species, occurring at high altitudes throughout Idaho, in adjacent areas in Washington and Oregon, as far as N.E. California. The flowers of this species are typical of *Synthyris*: a short wide corolla tube, with 4 lobes, of which the abaxial one is widest, with the two stamens inserted at its base.

The other species of *Synthyris* are all smaller, and grow in high montane or alpine localities. They can be divided into two distinct groups, one with laciniately once or twice divided leaves, the other with entire reniform leaves, more (*S. canbyi*) or less deeply crenate. The former group consists of a number of very closely related species, each with a very limited distribution range. It seems doubtful to me that some of the species which Pennell distinguishes are really distinct. Thus *S. lanuginosa* from alpine slopes in the Olympic Mountains of Washington and *S. hendersoni* from Central Idaho, both tomentose, seem to be

conspecific, whereas *S. dissecta* and *S. cymopteroides*, both alpine in Montana, both with long corolla tubes and 4 corolla lobes, also seem the same species. The two other species with bipinnate leaves are *S. paysoni* from Wyoming and *S. pinnatifida* from the Wasatch Mountains in Utah, both occurring in alpine habitats. The latter is small, and in size, habit, and shape of inflorescence, very much resembles *S. ranunculina*, but it has a short 4-lobed corolla tube.

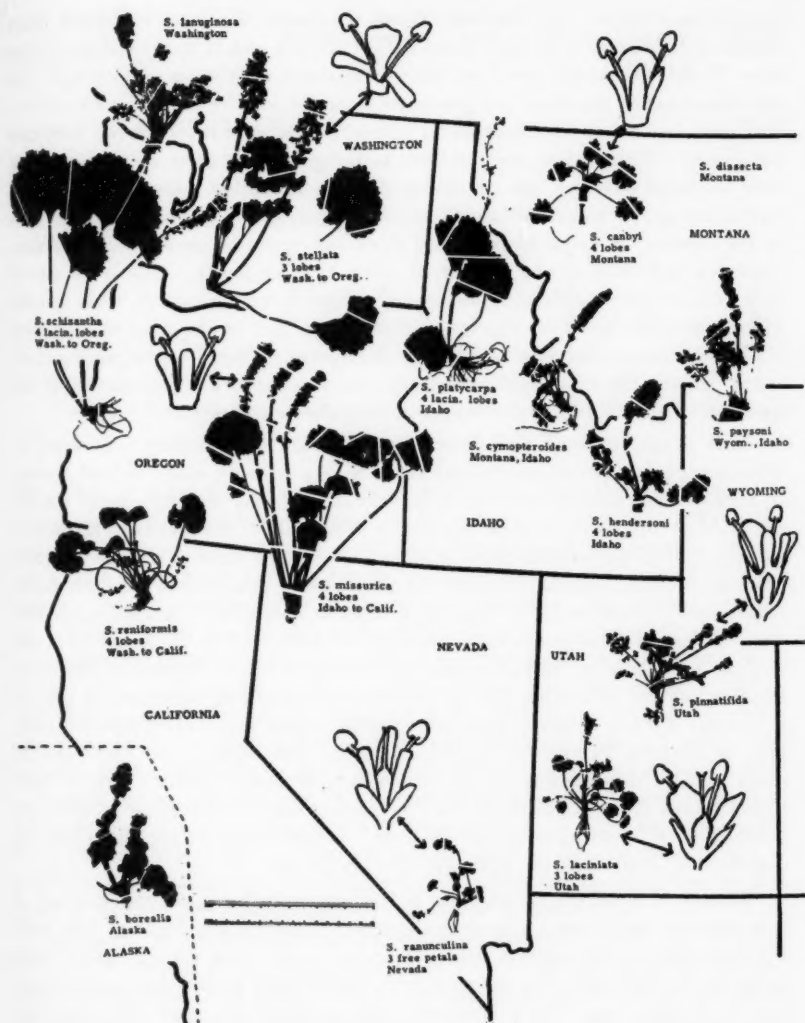
The remaining 3 species of *Synthyris* are all small, with reniform leaves. *S. borealis*, villose, occurs in Alaska at timberline. *S. laciniata* is found in Utah near snowbanks in the high country of the Wasatch Mountains. It has a wide, almost campanulate corolla, halfway slit into 3 oblong lobes, sky blue, and has 4 calyx segments. In very similar localities *S. ranunculina* grows in the Charleston Mountains at 3000–3200 m. altitude, near snowbanks. It has lost its corolla tube, but still has 3 narrow strap-like light blue petals, the two stamens inserted next to the sides of the wider abaxial petal. There are only 2 calyx segments.

In figure 1 all the described species of *Synthyris* are depicted through actual photographs of herbarium specimens, all at the same magnification. These photographs are placed on the map of the Western United States in the approximate place of their occurrence, with only the Alaskan *S. borealis* out of place. This figure shows the central position of *S. missurica* and the vegetatively closely similar *S. schizantha*, *S. stellata* and *S. platycarpa* towards the North and North-West. *S. reniformis* is off to the West. The group of species with bipinnate leaves is closely spaced in the North-Eastern and Eastern part of the distribution range, with only *S. lanuginosa* outside this range. And the small species with reniform leaves extend toward the NW, NE and South outside the general range of distribution of the genus. In figure 1 sketches of the flower or of the corolla of several species are also included, with the number of corolla lobes as far as I have determined them.

Synthyris and *Besseyia* provide excellent material for an evolutionary analysis. Since most of the species are montane or alpine, occurring in an area with an abundance of extensive mountain ranges and isolated mountains, individual populations have usually been separated for long periods of time, and had time to evolve as separate entities.

Flower structure places these genera close to *Veronica*. This genus of the Scrophulariaceae has about 200 species, and has evolved especially in its vegetative characters. With the exception of 2 (*V. ciliolata* and *V. pulvinaris* from New Zealand with 5 lobes), all species have 4 corolla lobes and 2 stamens, implanted next to the widest lobe. Most species are herbs, but more than one-third are shrubby or almost tree-like (Section *Hebe* from New Zealand). In several species the corolla is tubiform, but in most it is rotate. All have upright stems with opposite leaves, at least on the lower part of the stem. All species grow in temperate regions or are montane, and practically all have the same sky-blue flower color.

The genera most closely related to *Veronica* as indicated by the 2 stamens, the typical capsule, the sky-blue flower color, and the generally rotate corolla, have a very different habit: they all have short perennial caudices with rosettes of basal

Fig. 1. Distribution and Variation in *Synthyris*

long-petioled leaves. In the Old World the genus *Wulfenia* represents these *Veronica*-derivatives, all at high altitudes in Carinthia and in the Himalaya; in the New World *Besseyia* and *Synthyris* seem to be direct derivatives of *Veronica*. As mentioned earlier, the latter two genera are separated only by vegetative characters: leaf form and bracts on inflorescence. Even if these differences are not admitted for generic differentiation, we still have to recognize that there are two or three lines of differentiation: one of oblong dentate leaves, one of reniform crenate leaves, and one of pinnatifid leaves. In each line there is a tendency for reduction in the flowers: in calyx lobes, corolla lobes and petals in general. In addition, there is a reduction in the number of calyx lobes or sepals. This is of special interest since generic differentiation usually follows flower characters, while specific differences often reside in vegetative characters. But in the case of *Veronica*, *Wulfenia*, *Besseyia*, and *Synthyris* generic differences are based on vegetative characters, whereas the most significant subsequent evolutionary differentiation of the species of the latter two genera resides in basic flower characters.

It is usually believed that flower characters are only slightly influenced by environment, whereas vegetative characters have a strongly adaptive background. In *Synthyris* and *Besseyia*, however, reductions in the flower structure are of specific significance. But in *Besseyia* the reductions occur only in the species in the north-western part of the generic range, whereas in *Synthyris* these reductions are most pronounced in the southern limits of the genus, where *Besseyia* does not show flower reductions. Therefore, both arguments tend to strengthen the conclusion that the evolution of these genera in the direction of reductions in the flower structure was *not* a response to the environment nor due to an environmentally controlled selection process, but rather that it was in the nature of an orthogenetic process. In another respect, however, evolution in these genera may have proceeded along lines of selection by the environment. For in both *Besseyia* and *Synthyris* the major specific development occurs in montane or alpine habitats, but in both genera species at the northern limit of the genus (with the exception of *Synthyris borealis*) have found habitats near sea level. In both cases the lowland forms are considerably larger than the alpine or montane species.

Culture of *Synthyris ranunculina* in the laboratory has raised the question of how basic are the differences between the genera *Synthyris* and *Besseyia*. Normally *Synthyris* has a short ear-like inflorescence, with not more than 2 bracts lower down on the peduncle. But by growing *S. ranunculina* at very low temperatures (14° C in light and 4° C in darkness) the peduncles are very short, and the ear-like part elongates, with bracts over its whole length subtending rudimentary flower buds. Therefore, at the lowest temperature where growth is possible these *Synthyris* inflorescences look superficially as if they belong to *Besseyia*.

The condition of evolutionary flux which exists in the flower development of *Synthyris* is reflected in the instability of flower structure in plants grown in the Earhart Laboratory. A plant kept in the shade at 20° day - 14° night temperature

	Number Observed	Green Sepals	Petaloid Sepals	Petals	Stamens	Carpels
Flowers on Plants						
Growing Wild in						
Charleston Mountains.....Many	2	0	3	2	2	
Flowers Developed						
Two Lower						
in Greenhouse.....Flowers	2	1	3	3	1?	
	2	2	1	3	2	2
	1	2	2	3	3	1?
	1	2	2	4	2	2
	1	2	2	4½	2	2

Table I. Number of Flower Parts in Flowers of *Synthyris ranunculina*

had flowers of many different structures. In the sepal series there were only one or two additional ones which were petaloid by being narrow and blue towards the tip. When there were two extra sepals they were adjacent and abaxial. In one case a petal was partially laterally adnate to a petaloid sepal, with a small adventitious petal wedged between them at the point of adnation. The number of petals was unstable, but they were always choripetalous.

Perhaps the most amazing abnormality was the occurrence, in 3 out of 7 flowers, of a third stamen, in the gap between the 2nd and 3rd petal (the 2 normally occurring stamens are implanted at the sides of the adaxial 1st petal). This instability in stamen number is all the more amazing, since in *Veronica* and the other species of *Synthyris* and *Besseyia*, the stamen number is completely fixed to 2 and is not known to differ. In 3 of the flowers the ovary seemed reduced to only a simple carpel, but this could not be established. Table I summarizes the flower characteristics, showing that there are at least 6 different flower types in *Synthyris ranunculina*, and that probably all conceivable combinations of 2-4 sepals, 3-4 petals, 2-3 stamens and 1-2 carpels can be found.

Summary. A reexamination of the species of *Synthyris* shows that they can be placed in definite evolutionary lines, which show both morphological and geographic progression. Of special interest are the progressive reduction in flower structure, from 4 corolla lobes towards 3 lobes towards 3 free petals, and from 4 sepals to only 2, with the most reduced forms occurring at the greatest distance from the geographical center of the genus. In *Besseyia*, a closely related genus, the reduction of petals is similar, and in two species the corolla has completely disappeared. Again these reduced forms occupy the geographically remotest localities.

LITERATURE CITED

- Abrams, LeRoy. Illustrated Flora of the Pacific States. Vol. III. Stanford Univ. Press.
- Gail, F. W. and F. W. Pennell, 1937. A new species of *Synthyris* from Idaho. Amer. Jour. Bot. 24:39-40.
- Pennell, F. W. 1933 A revision of *Synthyris* and *Besseyia*. Proc. Acad. Nat. Sc. Philadelphia. 85:77-106.

THE NEW WORLD SPECIES OF CYNOMETRA

JOHN D. DWYER¹

Cynometra, a Linnean genus of approximately 75 species is widely distributed throughout the tropics. The New World species have not been studied in detail since Bentham's limited treatment in Martius Flora Brasiliensis in 1876. The present study seems particularly timely in view of the current intensive studies on the African species.

HISTORY OF THE GENUS

Linnaeus established the genus *Cynometra* in 1741 (Act. Soc. Upsal. 79) and included it in the first edition of *Species Plantarum* (p. 382. 1753), describing two species from India: *C. cauliflora* and *C. ramiflora*. Vogel described the first New World species: *C. americana* in 1836 (in Linnaea 10:602). In 1840 Bentham (Jour. Bot. 2:74) established the tribes Cynometreae and Amherstieae, including three species of *Cynometra* from tropical America: *C. baubiniaefolia*, *C. marginata*, and *C. crassifolia*; his subsequent treatment of the genus in Martius Flora Brasiliensis (1876) is classical. The well-known *Cynometra spruceana* was described therein. Four years before Bentham's initial work, Tulasne described two species from French Guiana: *C. hostmanniana* and *C. parvifolia* (Arch. Mus. Nat. Paris 4:181. 1844). With the exception of *C. cubensis* described by de la Sagra (Hist. Cub. 10:233. 1845), all the remaining New World species appeared after 1895.

Recently Léonard (1951) presented an excellent history of the African species. In this same paper he made an important contribution to the taxonomy of the African cynometras when he distributed some 60 species, classically assigned to the genus, among 11 genera. Those species with the stipe of the pistil free in the receptacle-cup were placed in *Cynometra* in limited sense and in *Gilletiodendron*.

INTERGENERIC RELATIONSHIP

To establish relationships between *Cynometra* and other genera is a challenging problem. If one considers the question on a regional basis, e.g. New World species only, and accepts the tribe Cynometreae as defined by Bentham as being clearly distinguishable from the allied tribe Amherstieae, the problem seems narrowed considerably. It has been traditional to follow this course in relating the New World cynometras. The Mexican, tropical American, and West Indian species have been related to the New World species of *Copaifera* and to the pantropical genus, *Crudia*; the leaves of these genera are multijugate and the flowers are apetalous, in contrast to *Cynometra* (New World) with unijugate leaves and 5 petals. While such characters are useful in distinguishing the genera, nevertheless, additional significant characters tend to make the problem of relationships of *Cynometra* on a world-wide scale a formidable task.

¹ Missouri Botanical Garden and St. Louis University, St. Louis, Missouri.

Initially the validity of the tribe Cynometreae (as defined by Bentham) is jeopardized by the fact that the most fundamental character utilized by its author: the stipe of the pistil free in the receptacle cup, is not constant for all species of several genera included in the tribe: *Crudia*, *Cynometra* (in wide sense), *Schotia* etc.¹ Léonard, in his recent monograph (1951) of the African cynometras, recognized the inconsistency and divided some sixty African species previously accepted in *Cynometra* among 11 genera. Those species with the stipe of the pistil free in the receptacle-cup were placed in the emended genus *Cynometra* and in *Gilletiodendron* (5 species). In his later treatment (1957) of the African genera of the Cynometreae-Amherstieae complex, he studiously avoided stressing this same character in emending the two tribes under discussion. He elected as his principal distinguishing character the non-envelopment (Cynometreae) or envelopment (Amherstieae) of the floral buds by bracteoles. Unquestionably this was an excellent choice for the African genera; whether it can be applied with success to the non-African Old World genera is an interesting problem. Any discussion of this here would be out of place.

A noteworthy point in considering broad intergeneric relationships involving *Cynometra* is the lack of attention paid to the tropical American tribe Sclerolobieae (nine genera and approximately 60 species). In my opinion it is impossible to define the limits of the tribes Cynometreae and Amherstieae without giving careful consideration to this group.² Among its nine genera we find some genera with free central attachment of the stipe (*Sclerolobium*, *Diptychandra* etc.), some with eccentric attachment (*Dicymbe*); two have the bracteoles enveloping the floral buds (*Dicymbe* and *Thylacanthus*), while the remaining seven have bracteoles not enveloping the buds.

A third factor in establishing intergeneric relationships is the obvious relationship of *Cynometra* with the Papuan genus *Maniltoa*. A superficial glance at herbarium material of *Maniltoa* (unfortunately poorly represented in herbaria) suggests their proximity. The foliage, young strobiliform racemes, and legumes are strikingly similar. The flowers of *Maniltoa* differ in several respects from those of *Cynometra* in the narrow sense: the receptacle-cup is usually more elongate, the stipe is often eccentric in position, and the stamens are numerous. The occasional fusion of the stipe to the wall of the hypanthium suggests affinity with one of the African segregates of *Cynometra*, the genus *Schotia*, also known in the Papuan-Melanesian region. The need for a critical study of the relationships between *Cynometra* and *Maniltoa* is suggested by A. C. Smith in two recent papers (*Sargentia* 1:36-38. 1942; and *Jour. Arnold Arb.* 21:166-171. 1950.).

¹ The stipe is constantly free in all New World cynometras, and likewise in all African species according to Léonard's concept. While the same is probably true for the Indian and Papuan-Melanesian species, a thorough study of *Cynometra* and its ally *Maniltoa* in these areas is much needed.

² It is my opinion that the tribes Cynometreae, Sclerolobieae, and Amherstieae should be united to form one large tribe Amherstieae. This will be the subject of a separate paper.

In relating the New World cynometras therefore, we must seek affinities with genera traditionally placed in three tribes: Cynometreae, Amherstieae, and Sclerolobieae. The remarkable floral stability of the New World cynometras suggests that this group diverged from the main line evolving in Africa and were able to maintain themselves in a stable fashion in the New World. With the exception of the anomalous *C. fissicuspis* all the New World cynometras seem to resemble more closely (in a limited number of characters) Léonard's "groupe 2." Except for the fact that the extra-African Old World cynometras frequently have multi-jugate leaves, or occasionally simple leaves, the New World cynometras are structurally quite similar. Bentham in 1840 (in Hook. Lond. Jour. Bot. 100) remarked that "These American Cynometrae are similar to the Asiatic . . . decandrous ones, in the flower and inflorescence."

In viewing the problem of intergeneric relationships on a strictly regional basis, i.e. in the New World, *Cynometra* seems to be more closely related to the genus *Peltogyne* than to *Copaifera* and *Crudia*. The presence of petals, the subimbricate nature of the sepals, as well as the unijugate character of the leaves, suggest this. Their ranges are similar, extending from Mexico to south-eastern Brazil, although *Peltogyne* is absent from the West Indies. *Peltogyne* is readily distinguished from *Cynometra* by its pellucid-punctate leaflets, usually larger flowers, subclavate buds, glandular-punctate and usually densely pubescent sepals, more dilated stigmas, several to numerous ovules, paniculate inflorescences, and the often dehiscent legumes. That some of the species of *Peltogyne* have the stipe of the pistil eccentric is worthy of note.

MORPHOLOGICAL CHARACTERISTICS

STIPULES—these were not found on herbarium specimens, except a few of seedlings deposited in Utrecht. As Britton and Rose (1930) and Amshoff (1939) have indicated, the stipules are filiform and setaceous and measure up to 1 cm. in length.

LEAVES—the leaves of the New World cynometras are consistently unijugate, in this respect differing from several Old World species, e.g. *C. megalcephala* and *C. mannii*. Petioles are obvious in the New World species while petiolules are occasionally measurable, e.g. *C. hostmanniana*, *C. trinitensis*, and *C. crassifolia*, or are represented by a black glandular area at the base of the lamina. Occasionally a weak filiform extension terminates the petiole proper. While most cynometras have leaflets which are oblong or lanceolate, several divergent forms exist. Of the New World species *C. hostmanniana* alone has consistently equilateral laminas, while those of *C. marginata* var. *acuminata* are occasionally equilateral. Strongly inequilateral leaflets, on the other hand, characterize several species: *C. cubensis*, *C. oaxacana*, and *C. duckei*. In most species the blades are obviously acuminate, with a few: *C. spruceana* var. *phaselocarpa*, *C. microflora*, and *C. duckei*, with very obtuse leaflets. In two collections (Purpus 7383, the type of *C. oaxacana*, and Spruce s. n., K. type of *C. spruceana* var. *procera*) the leaves were found to

vary widely in texture and venation, some being thin and obviously reticulate, while others of the same collection were found to be thicker and smoother, with the principal veins immersed or evanescent. This is disconcerting inasmuch as considerable emphasis is placed on these characters in segregating the species.

The leaflets of the New World cynometras are not glandular-punctate although Pittier, the author of the confusing *C. fissicuspis*, assigns this character to the leaflets (cf. my discussion p. 342, this paper); Tulasne, too, in his original description of *C. parvifolia*, characterizes the blades as "interdum pellucido-punctatis." In the present study considerable attention was paid to the rugulose nature of the blade (under mag.) of some species as well as the papillate nature of the leaflets of other species. These are not completely reliable diagnostic characters at the species level inasmuch as the blades of some collections of *C. marginata* may be rugulose while others on the same twig are papillate. In general, however, those leaves with obviously reticulate leaflets are invariably papillate, and conversely those with immersed or plane secondary veins are rugulose. Among the New World cynometras only the new species, *C. duckei*, has the leaflets neither papillate nor rugulose above.

While petioles are invariably pubescent, the leaflets are rarely so (*C. baubiniaefolia* var. *macrophylla*, some collections of *C. cubensis*, *C. crassifolia*, *C. longicuspis*). In most cases the hairs are confined to the mid-veins or may extend to the secondary veins, although the type of *C. baubiniaefolia* var. *macrophylla* has completely pubescent blades.

INFLORESCENCES—two features of the inflorescence are useful for diagnostic purposes: the relative length of the rachis, and secondly the numbers of flowers present. Scarcely measurable rachises are occasionally densely flowered, e.g. *C. schottiana*. The usually elongate pedicels tend to persist on the rachis until the petals fall away. Initially the rachis emerges from a gemmiform cluster of concave and imbricate bracts, which are often persistent. Such collections of bracts, frequently described as strobiliform, are characteristic of other genera of the tribe Cynometreae: *Guibourtia*, *Copaifera*, etc. Unlike the bracteoles the bracts are stiffer, more crassate, and more uniformly pubescent (except in *C. hostmanniana*).

The bracteoles are oblong, carinate (doubtfully so in section *NUMMUS*), and paired, being attached at the base of the pedicels in most species. In three species: *C. spruceana*, *C. longifolia*, and *C. stenopetala* these appear to be located along the middle third of the pedicel. Bracteoles were not observed in *C. americana*, *C. cubensis*, *C. portoricensis*, *C. schottiana*, and *C. crassifolia*. Since bracteoles are soon deciduous it is possible that they may be present on immature inflorescences of these species.

The pedicels of the flowers are slender in all species, being better described as filiform in *C. spruceana*, *C. cuneata*, and *C. longiflora*. The reduction or absence of hairs on the floriferous pedicels of *C. hostmanniana* and *C. microflora* is noteworthy.

FLORAL STRUCTURE—the receptacle-cup or hypanthium, while small, is obvious as in most genera of the Amherstieae-Cynometreae complex, with the perianth and the androecium borne on the margin of same. The external pubescence of the hypanthium and the thickness of the wall are of little importance as interspecific characters in the New World cynometras.

The sepals are always somewhat unequal and reflexed at anthesis though not markedly so in *C. fissicuspis*. Although varying little in puberulence, venation etc., they are uniformly scarious in texture except in *C. americana*. These number 4 or 5, although reduction to three per flower is not uncommon. The flowers of *C. oaxacana* and *C. marginata* are occasionally bisepalous. The sepals are puberulent on the outside, often sparsely so; occasionally sepals of *C. oaxacana* and *C. spruceana* may be glabrous.

The petals of the New World cynometras show little variation in shape and venation, and are regularly thin except in *C. americana*. They are glabrous, except that those of *C. baubiniaefolia* var. *macrophylla* and *C. parvifolia* may occasionally have a few apical or marginal hairs. In *C. portoricensis* and *C. stenopetala* the petals are of about the same length as the sepals.

The stamens are constantly 10 and glabrous. No staminodia were found in the numerous flowers dissected; the filaments are consistently slender, unequal in length, and united very briefly at the base. The anthers are always small, not exceeding 1.5 mm. in length, and versatile. In general the androecium furnishes no diagnostic characters of importance.

Equally disappointing in furnishing diagnostic characters is the pistil. In the key to species only three ovarian characters are utilized: the few hairs in *C. trinitensis*, the appressed sericeous condition of *C. cuneata*, and the glabrous condition of *C. fissicuspis*.

FRUITS—the fact that only about 10% of the herbarium material examined bore fruit presented considerable difficulty in interpreting the material. Despite this the legumes provide several important characters: size, thickness of the wall of the valves, and surface modification of the valves. Most ripe fruits are glabrous although the valves of *C. baubiniaefolia* are velutinous while those of *C. spruceana*, and occasionally *C. portoricensis*, are puberulent. Whether this is a consistent character in the first two species is questionable. The pods are usually oblong, and turgid, and only occasionally are compressed, e.g. in *C. portoricensis* and *C. hondurensis*. They are regularly indehiscent. Amshoff states that *C. hostmanniana* has "infertile pods . . . at last splitting into 2, showing no cavity at all." A collection of *C. hostmanniana* (Froes 25771) has pods which seem to have split open irregularly on drying. This same irregular dehiscence was noted on a collection (Elmer 12954) of *C. bijuga* from the Philippine Islands.

The pericarp in dried fruit is usually very spongy in appearance on the broken surface and light in weight. The wall may range from 0.5 mm. (*C. parvifolia*) to 3 mm. (*C. retusa*) in thickness. This is probably an excellent diagnostic character, the limited fruiting material however, makes it difficult to evaluate. The pods

are of 4 types with reference to the character of the surface: relatively smooth with minute granulations or excrescences (*C. hemitomophylla*, *C. portoricensis*); obviously rugate and bearing some resemblance to the convolutions of a mammalian cerebrum (e.g. *C. baubiniaefolia*); tuberculate (e.g. *C. duckei*); smooth, lustrous and vaguely reticulate (one species, *C. fissicuspis*). Rugate and tuberculate types are themselves often minutely granulose.

The fruits of *C. fissicuspis* are noteworthy inasmuch as they bear some resemblance to the pods of several African species placed by Léonard in his "Groupe 3." On the other hand these African species diverge markedly in having several pairs of leaflets, five sepals, bracteoles often articulate at the summit of the pedicels, and dehiscent fruits. The fruits of the taxa of "Groupe 3" are apparently more strongly reticulate and are not round but oblong in shape.

An examination of the legumes of the non-African Old World species indicates that they are regularly indehiscent and in general are either distinctly rugate or tuberculate, some being deeply incised on the surface.

INTERSPECIFIC RELATIONSHIPS AND GEOGRAPHIC DISTRIBUTION

As suggested previously the New World cynometras are closely knit morphologically with surprisingly few characters of diagnostic importance. In view of the paucity of useful floral characters and the few legumes available for study, the foliage assumes added importance. Among the numerous species placed in section COMATOVARIA, those confined to Mexico and Central America tend to have considerably larger leaflets and to a lesser degree more compressed racemes than their South American allies. The fact that approximately one-half of the New World cynometras are found in Amazonia, with four species of the group: *C. longifolia*, *C. longicuspis*, *C. stenopetala* and *C. duckei*, restricted to the Brazilian states of Pará and Amazonas, suggests that Amazonian Brazil is the center of geographical distribution for the New World species.

Three new sections are proposed herein for the New World cynometras: COMATOVARIA, GUIANA and NUMMUS.³ A view of Léonard's 3 "groupes", proposed for the African species of the genus, indicates that the 3 sections proposed for the New World species bear little relationship with those tentatively proposed for Africa.

ECONOMIC IMPORTANCE

Although the cynometras are trees, the New World species are apparently of little use commercially. In discussing *C. sphaerocarpa*, Pittier, the author of the species (in *Enum. Plantas Usuales* 184. 1926) states that the wood is excellent for construction. In the same discussion he adds that the seeds "son estomáquicas y

³ NUMMUS (L. = coin) refers to the fancied resemblance of the legumes of *C. fissicuspis* to a coin. COMATOVARIA (comatus L. = densely hairy) refers to the fact that the ovaries of all species are conspicuously hairy.

antipalúdicas." No oleoresins of commercial value have been reported for the New World cynometras.⁴

Standley in his *Flora of Lancetilla Valley* (Honduras), in Field Mus. Nat. Hist. 10:219. 1931, states that the wood of *C. retusa* is used for charcoal.

Record and Hess (*Timbers of the New World*, p. 252, 1943) list several common names which I have not seen on the labels of herbarium material: "courbaril (Haiti); bruta de danto (Hond.); . . . herairo (Peru), guarabu amarello, iauaranami, jutahy-rana, pororoca (Brazil), ingá-puita (Arg.)."

ACKNOWLEDGEMENTS

I wish to express my appreciation to the Missouri Botanical Garden for the use of its herbarium and library facilities. I wish also to thank the directors of the institutions listed below who were kind enough to allow me to examine herbarium material of *Cynometra*. For purposes of citation a letter designating the particular institution is used:

- Arnold Arboretum, Harvard University, Cambridge, Mass. (A)
- Jardin Botanique de l'Etat, Bruxelles, Belgium. (B).
- Chicago Natural History Museum, Chicago, Ill. (F).
- Conservatoire et Jardins Botaniques, Geneva, Switzerland. (G).
- Department of Agriculture, Georgetown, British Guiana. (BRG).
- Royal Botanic Garden, Kew, England. (K).
- Herbarium, Department of Botany, University of California, Los Angeles, Calif. (LA).
- Missouri Botanical Garden, St. Louis, Mo. (MO).
- New York Botanical Garden, New York, N. Y. (NY).
- Museum National d'Histoire Naturelle, Laboratoire de Phanérogamie, Paris, France. (P).
- Seccao de Botanica Sistemática, Jardim Botânico do Rio de Janeiro, Rio de Janeiro, Brazil. (R).
- Botanische Museum en Herbarium van de Rijksuniversiteit te Utrecht, Utrecht, Netherlands. (U).
- División de Botánica, Ministerio de Agricultura y Cría, Caracas, Venezuela. (V).
- Naturhistorisches Museum, Botanische Abteilung, Wien, Austria. (W).
- Yale University School of Forestry, New Haven, Conn. (Y).

TAXONOMY

CYNOMETRA L. Act. Soc. Upsal. 79. 1741 and Sp. Pl. ed. 1. 382. 1753.

Trees or shrubs. Stipules filiform, soon deciduous. Leaves simple or pinnately compound (exclusively unijugate in New World), the blades equilateral to inequilateral, usually acuminate, emarginate, the venation pinnately reticulate, the margin entire. Racemes or panicles. Racemes usually strobiliform in young state, usually one to several per axil, the bracts scarious or membranaceous, the bracteoles paired, not enveloping the young bud, deciduous. Flowers obviously pedicellate, occasionally articulate. Receptacle cup short, usually without a thickened disc. Sepals usually 4-5, but occasionally 2 or 3, free, imbricate, unequal, usually reflexed. Petals 5, usually equal in length; stamens 10 (8-12 by exception)

⁴ True copal is obtained from a number of trees of the Leguminosae. *C. sessiliflora* Harms of the Old World is the only member of the genus known to yield copal.

glabrous, the anthers small, versatile, the filaments slender, usually very briefly united at base; stipe of pistil free in receptacle cup, the ovary usually hairy, the style slender, the stigma capitate, the ovules 1-2 (3 or 4 by exception). Legumes dehiscent or indehiscent, usually rugate or tuberculate on surface, occasionally smooth, the seeds 1-2.

Type species: *C. cauliflora* L.

KEY TO SECTIONS OF NEW WORLD CYNOMETRAS*

- a. Ovaries hairy; fruit not reticulate.
 - b. Leaflets obviously inequilateral; pedicels of flowers pubescent; larger bracts 2-5 mm. long; bracteoles present (some species uncertain) but soon deciduous.....Section 1. COMATOVARIA Dwyer
 - bb. Leaflets regularly equilateral; pedicels of flowers glabrous to scarcely pubescent; bracts about 1 mm. long, glabrous; bracteoles absent.....Section 2. GUIANA Dwyer (Species 21. *C. hostmanniana*)
- aa. Ovary glabrous; fruit reticulate.....Section 3. NUMMUS Dwyer (Species 22. *C. fissicuspis*)

Section 1—COMATOVARIA Dwyer

- a. Perianth obviously carnose.....Subsection A—COMATOVARIA
 - 1. *C. americana*.
- aa. Perianth non-carnose.....Subsection B—TENUIFLORA Dwyer
 - b. Leaflets more than 2 cm. long (except some leaflets of *C. cubensis*, *C. microflora* and *C. duckei*), not narrow-lanceolate.
 - c. Lowermost veins (if seen) well-spaced along costa and not spreading flabellately; legumes not velutinous (except possibly *C. spruceana*).
 - d. Secondary veins visible above.
 - e. Leaflets (1-)2-4 cm. long, obtuse or only vaguely acuminate. West Indies.
 - f. Leaflets obliquely oblong-rotund or obliquely oblong, (1-)2-2.5 cm. long, obtuse at apex; petals 6-8 mm. long, obviously longer than sepals; legumes plump, papillate and scrobiculate.....2. *C. cubensis*.
 - ff. Leaflets narrow-oblong, 5.5 cm. long, obtuse or only vaguely acuminate at apex; petals up to 3.5 mm. long, as short or shorter than sepals; legumes compressed to turgid and with dark brown excrescences.....3. *C. portoricensis*.
 - ee. Leaflets 4-14 cm. long, acuminate. Mexico and tropical America.
 - g. Largest leaflets 8-14 cm. long; legumes 2-4 cm. long, crustulose. Central America. (*C. trinitensis*?).
 - h. Leaflets coriaceous; legumes turgid.
 - i. Hairs densely disposed on valves of ovary.
 - j. Leaflets narrow-oblong or oblong-lanceolate, 4-11 cm. long, 2-3.5 cm. wide; the secondary veins prominent or immersed; fruit nutmeg-like in shape, the pericarp up to 3 mm. thick. Mexico, Guatemala, Honduras, and British Honduras.....4. *C. retusa*.

* In order to publish validly the new section and subsections the following latin descriptions are appended:

COMATOVARIA Dwyer, sect. nov.: Folia inaequilateralia. Pedicelli florum dense puberuli. Legumina non reticulata. Species typica: *C. americana* Vogel.

Subsect. COMATOVARIA. Sepala petalaeque carnosae. TENUIFLORA Dwyer, subsect. nov. Sepala petalaeque tenuia. Species typica *C. baubiniæfolia*.

GUIANA Dwyer, sect. nov.: Folia aequilateralia. Pedicelli florum vix puberuli vel glabri. Legumina non reticulata. Species typica: *C. hostmanniana*.

NUMMUS Dwyer, sect. nov. Ovaria glabra. Legumina reticulata laevia compressa. Species typica: *C. fissicuspis*.

- jj. Leaflets elliptic, 9–14 cm. long, 3–5 cm. wide, the secondary veins prominulous; fruit turgid but not rotund, the pericarp up to 2 mm. thick. Costa Rica.....5. *C. hemitomophylla*.
- ii. Hairs sparsely scattered on valves of ovary.....6. *C. trinitensis*.
- hh. Leaflets stiff-papyraceous to stiff-chartaceous.
- k. Rachises 0.8–2 cm. long; pedicels 0.5–0.6 cm. long.....7. *C. bondurensis*.
- kk. Rachises 0.2–0.3 cm. long; pedicels up to 1.3 cm. long.....8. *C. schottiana*.
- gg. Largest leaflets 4–9 cm. long (except *C. cuneata* and *C. longifolia* often longer); legumes 1–2 cm. long (except *C. longicuspis* are longer), crustulose or rugulose. Mexico and tropical South America.
- l. Leaflets minutely papillate (sub. mag.) (except *C. oaxacana*); costa prominulous; rachises of inflorescences 0.2–2 cm. long; pedicels of flowers up to 1.2 cm. long (except *C. marginata* var. *acuminata* up to 1.8 cm. long and *C. cuneata* up to 2 cm. long), the bracteoles attached basally.
- m. Petioles 0.2–0.8 cm. long; rachises of inflorescences 3–10 flowered, 0.2–2 cm. long; petals 2.8–5.2 cm. long; hairs of ovary not uniformly appressed.
- n. Leaflets stiff-chartaceous to thin-coriaceous; sepals 2.5–4.5 mm. long; petals 3–5 mm. long.
- o. Leaflets oblong, sub lanceolate or narrow-elliptic, 4–7 cm. long; 1.5–3 cm. wide, acuminate; sepals 3–4; wall of pericarp up to 1 mm. thick. Surinam, Venezuela, Brazil, British Guiana.....9. *C. marginata*.
- oo. Leaflets ovate-oblong to ovate-sub lanceolate, 3.5–8 cm. long, 1.5–5 cm. wide, obtuse; sepals frequently only 2; wall of pericarp up to 0.5 mm. thick. Mexico.....10. *C. oaxacana*.
- nn. Leaflets coriaceous; sepals 2.0–3.5 mm. long; petals 2.3–5.2 mm. long.
- p. Leaflets petiolulate for 1 mm.; lowermost veins of lamina sharply ascending; sepals 2.5–3.5 mm. long; petals 4.5–5.2 mm. long, 1.2–1.6 mm. wide.....11. *C. crassifolia*.
- pp. Leaflets not obviously petiolulate; lowermost veins ascending at about the same angle as upper veins; sepals 2–3 mm. long; petals 2.3–2.8 mm. long, 0.5–1 mm. wide.....12. *C. stenopetala*.
- mm. Petioles 0.5–1.8 cm. long; rachises of inflorescences 10–20 flowered, up to 2 cm. long; hairs of pistil uniformly appressed.....13. *C. cuneata*.
- ll. Leaflets rugulose (sub. mag.); costa usually plane above; secondary veins plane or immersed above; rachises of inflorescences 0.2–6 cm. long; pedicels of flowers 1–2 cm. long, the bracteoles (or scars) below middle but not strictly basal.
- q. Rachises of inflorescences 0.2–2 cm. long; majority of bracts deciduous at anthesis; flowers up to 15 per rachis.
- r. Legume obviously rugose.....14. *C. spruceana*.
- rr. Legume rough but not rugose.....15. *C. longicuspis*.
- qq. Rachises of inflorescences up to 6 cm. long; majority of bracts persistent at anthesis; flowers 30–50 per rachis.....16. *C. longifolia*.
- dd. Leaflets with secondary veins scarcely visible above (sub. mag.), non-papillate or rugulose above; fruit tuberculate.....17. *C. duckei*.
- cc. Lowermost pair of veins on wider side flabellately disposed and usually of same size basally as costa; legumes rugose and velutinous.
- s. Leaflets obliquely ovate-oblong to ovate-lanceolate 1–4 cm. long, 0.5–2 cm. wide; pedicels pubescent.....18. *C. baubiniaefolia*.
- ss. Leaflets ovate-rotund or oval-lanceolate, up to 2 cm. long, up to 1.5 cm. wide; pedicels glabrous.....19. *C. microflora*.
- bb. Leaflets less than 2 cm. long, narrow-lanceolate.....20. *C. parvifolia*.

1. CYNOMETRA AMERICANA Vogel, in Linnaea 10:602. 1836.

Small tree. Branchlets glabrous, ultimately lustrous and rubescent, the lenticels pustulate. Petioles 0.4–1 cm. long, glabrous. Leaflets oblique-lanceolate, oblique-oblong or ovate-oblong, occasionally subtrapeziform, 5–14 cm. long, 2.5–5 cm. wide, tapering cuneately into an acumen, ultimately obtuse and retuse, the wider side tapering narrowly or frequently subauriculate at base, the costa prominulous above, the secondary veins prominulous above, more prominulous beneath, the lamina thin-coriaceous, rugulose above, papillate beneath,

lustrous, inequilateral, glabrous. Bracts oblong or oblong-rotund, up to 2.5 mm. long, up to 2 mm. wide, puberulent dorsally and marginally. Bracteoles somewhat concave, oblong, up to 2 mm. long. Racemes 1-3 per axil, the rachises 0.1-0.5 cm. long, puberulent, the flowers about 10 per rachis; sepals 3-4, oblong-rotund, ovate-rotund to rectangular, 3.5-4.5 mm. long, 2-3.5 mm. wide, carnose, glabrous; petals obovate-oblong to oblong, 4.2-5 mm. long, 2-3.5 mm. wide, spatulate or obtuse at base, carnose; filaments 4.5-7 mm. long, carnose; anthers subrotund, 0.8-1 mm. long; ovaries oblong to subrotund, 2-3.5 mm. long, carnose, densely pubescent, the style 2.5-3.5 mm. long, carnose; legumes (here immature?) oblique-oblong, up to 1.5 cm. long, compressed, marcescent, finely velutinous.

HAITI: Les Attricot, *Eyerdam* 310 (A, NY, US); Petionville, *Ekman* H2343 (A, US); Port de Paix, *Ekman* H4563 (A, US); vicinity of Jean Rabel, River Cote de Fer, *Leonard & Leonard* 12748 (US).

C. americana, endemic to Haiti has several obvious distinguishing characteristics: the carnose perianth parts and the relatively large leaflets which are strikingly bicolor and which usually taper cuneately into an acumen. The carnose character of the perianth is not encountered in any other New World species, and is the chief reason for placing *C. americana* in a separate subsection.

2. *CYNOMETRA CUBENSIS* Rich. in de la Sagra Hist. Cuba 10:233. 1845. (T.: *de la Sagra* s. n.!).

Shrub or small tree. Branchlets glabrous, stiff, the lenticels obvious. Petioles 0.2-0.4 cm. long, glabrous to puberulent. Leaflets obliquely oblong-rotund or oblique-oblong, occasionally subtrapeziform, 0.8-2.5 cm. long, almost as wide as long, very inequilateral, the narrow side often 1/6th the width of the wide side, reticulate especially below, obtuse at apex, ultimately retuse, obtuse at base on wide side, vaguely papillate (under mag.), the costa prominulous above but evanescent apically, occasionally pubescent, the secondary veins about 7, subprominulous to subimmersed, the lamina coriaceous to thin-coriaceous, smooth and lustrous above, obviously inequilateral, glabrous. Bracts oblong-rotund to narrow-oblong up to 3 mm. long, ferrugineo-puberulent dorsally; bracteoles not seen. Racemes apparently one per axil, the rachises 0.5-1 cm. long, ferrugineo-puberulent, the flowers 6-10 per rachis, the pedicels 0.6-1.2 cm. long, about 0.6 mm. wide, ferrugineo-puberulent. Sepals 4-5, oblong to oblong-rotund, 4-6 mm. long, 1.5-3.2 mm. wide, pubescent basally within; petals lanceolate, 6-8 mm. long, 2-2.6 mm. wide, acute at apex, spatulate at base; filaments 7-11 mm. long, the anthers oblong, about 0.8 mm. long; ovary obliquely-oblong, about 3 mm. long, 1.8 mm. wide, densely pubescent, the style about 5 mm. long, subcrassate proximally, obviously eccentric. Legume obliquely elliptic, up to 3 cm. long, plump, granulose or crustulose, the wall of the pericarp up to 0.8 mm. thick.

CUBA: without locality, *Wright* 2386 (G, US); Pinar del Río: Sierra de los Organos, *Ekman* 12684 (A, G), 12978 (A, US); Morillo, *Ekman* 17375 (A, G, NY); Buenavista, Cayajabos, *Léon* 13552 (NY), 13805 (NY); Río Francisco, *Ekman* 18204 (A, NY); Valenzuela (?), *de la Sagra* s. n. (P); Havana, *de la Sagra* 307 (A, G).

C. cubensis is closely allied to the only other West Indian species, *C. portoricensis*.⁵ Both have unusually small obtuse to vaguely acuminate leaflets. The Cuban species has more or less orbicular leaflets in contrast to the narrow-oblong blades of *C. portoricensis*. The flowers of *C. cubensis* are much larger and the rachis of the racemes more elongate. The fruits are more turgid with the crustulose excrescences less prominent than in its ally.

The de la Sagra collection in Paris is probably the type despite the fact that the locality on the label (Valenzuela) does not agree with the cited type locality: "Vuelta de Abajo." It is an excellent match for the illustration (plate 41) in de la Sagra's *Hist. Cuba* 1845.

In several dissections the sepals proved to be puberulent at the base within. This was not observed in the calyx of any other New World *Cynometra*. The type description indicates that "filaments (stamens) . . . subvillosa". This was not observed and is probably an error inasmuch as the filaments of all cynometras are glabrous. The common name of *C. cubensis* is "Pico de Gallo."

3. *CYNOMETRA PORTORICENSIS* Krug and Urban, in *Symb. Ant.* 1:312. 1899. (T.: *Sintenis 5600!*).

Small tree. Branchlets somewhat smooth, rimose, glabrous, the lenticels often papillate. Petioles 0.2–0.3 cm. long, puberulent. Leaflets narrow-oblong to oblong or lanceolate, 1.6 cm. long, 0.5–2.6 cm. wide, obtuse to vaguely obtuse-acuminate at apex, obtuse to subauriculate at base on wide side, the costa prominulous above but evanescent apically, the secondary veins ± 10 , often plane or subimmersed above, the lamina reticulate especially below, not papillate above, vaguely papillate below, coriaceous, lustrous, inequilateral to equilateral, glabrous. Bracts ovate-rotund, about 2 mm. long; bracteoles not seen. Racemes apparently solitary in the axils, the rachises up to 0.5 cm. long, puberulent, the flowers few per rachis, the pedicels 0.4–0.6 cm. long, densely pubescent; sepals 4–5, oblong, about 5 mm. long; petals oblong, 2.5–3 mm. long, obtuse to subspatulate at base, white in vivo; filaments up to 5 mm. long, the anthers oblong, 0.8–1 mm. long; ovaries densely pubescent, the style about as long as ovary. Legume oblong, 2.5–3 cm. long, 1.5–1.8 cm. wide, compressed or turgid, the surface with crustaceous excrescences, velutinous or glabrous, the wall of pericarp about 1 mm. thick.

PUERTO RICO: near Rincón "ad Quebrada el Salto", *Sintenis 5600* (A, B, G, P, U, W); Barrio Rosario near Mayagüez, *Cowles s. n.* (US); near Arecibo, *Cowles 347* (NY), *2048* (NY); Rosario, San Germán (NY); Vega Alta, *Gleason & Cook A-21*, *A-136* (NY).

DOMINICAN REPUBLIC: Barahona, *Fuertes 1452* (NY, P); Santo Domingo City, Río Oxuma, *Ekman 12511* (A, US); Com. Palmar, *J. Jiménez 2495* (US); Lopez, Prov. Santiago, *Jiménez 458* (US).

The description of the flowers is of particular interest inasmuch as Krug & Urban did not include this in their original diagnosis. Noteworthy is the fact that

⁵ This statement is based on the assumption that *C. trinitensis* is not a West Indian species.

the petals are shorter or barely as long as the sepals. Krug and Urban originally described the legumes as "postremo dehiscentia." This seems questionable especially in view of the fact that the herbarium material lacks dehiscent fruits. As indicated in the introduction, legumes with regular dehiscence are not found in the New World cynometras.

4. *CYNOMETRA RETUSA* Britton and Rose, in Trop. Woods 7:5. 1926. (T.: Record 8832!).

Small tree. Branchlets smooth, glabrous to puberulent, the lenticels often scattered-punctate. Petioles 0.4–0.7 cm. long, glabrous to puberulent. Leaflets narrow-oblong to lance-oblong, 4–11 cm. long, 1.2–4 cm. wide, usually attenuate-acuminate at apex, often falcately so, obtuse or cuneate at base on wide side, the costa prominulous above, the secondary veins ± 10 , prominulous or immersed, the lamina vaguely to obviously rugulose or papillate above, papillate beneath, thin-coriaceous, lustrous above, inequilateral, glabrous. Bracts disposed as a lanceolate cluster in bud, up to 2 cm. long, ovate to ovate-lanceolate, 3.5–5 mm. long, densely puberulent dorsally; bracteoles oblong, about 2 mm. long, ciliate on back, soon deciduous. Racemes apparently solitary in the axils, the rachises 0.4–0.6 cm. long, puberulent, the flowers 10–20 per rachis, the pedicels slender, 0.4–1.5 cm. long, about 0.35 mm. wide, ferrugineo-villose. Sepals 4–5, oblong, 2.8–5.2 mm. long, 1.5–2 mm. wide, sparsely ciliate at apex and on margins; petals obovate-oblong to oblong, 5–6.5 mm. long, 0.8–2 mm. wide, obtuse to subacuminate at apex, subspatulate at base; filaments of stamens up to 7 mm. long, the anthers oblong, 0.7–1.2 mm. long; ovaries obliquely oblong, densely lanate, the styles 2–3.2 mm. long. Legumes oblong-rotund to inequilaterally oblong, up to 1.8 cm. long, 1.8 cm. wide, nuciform, minutely apiculate, the surface minutely crustose, the pericarp wall about 3 mm. thick.

MEXICO: TABASCO: Nacajuca, *Roviroa* 748 (US).

GUATEMALA: Los Andes, *Record* 8832 (NY, Y); ALTA VERAPAZ: Chinajá, *Steyermark* 45565 (F, US); Cubilguitz, *Steyermark* 44557 (F); IZABAL: Río Chaciún, Jocoló, *H. Johnson* 1291 (F, US); Quiriguá, *Standley* 24254 (NY, US); near Cristina, *Steyermark* 38671 (F).

HONDURAS: YORO: Progreso, *Hottle* 23 (F); ATLÁNTIDA: San Alejo (?), *Standley* 7873 (F); Tela, *Standley* 52915 (A, F, NY, US), 56686 (A, F, G, NY, US); La Ceiba, *Yuncker, Koepfer & Wagner* 8007 (F, G, MO, NY, US).

BRITISH HONDURAS: *British Honduras Forest Dept.* 5 (Y).

This relatively well collected species is, according to S. J. Record (cf. Britton & Rose's original description), "... one of the commonest trees of the forest" (Guatemala). The narrowly oblong to oblong-lanceolate leaflets, lustrous above, are striking. The densely flowered and compressed racemes resemble those of *C. trinitensis* but their rachises are shorter. The thickness of the wall (3 mm.) of the small nutmeg-like fruits is noteworthy. According to Record and Hess (*Timbers of New World* p. 252, 1943) the vernacular name is "pata de cabra" (goat's foot) because of the fancied resemblance of the paired leaflets to the foot of a goat.

5. *CYNOMETRA HEMITOMOPHYLLA* (Donn. Sm.) Donn. Sm. in N. Am. Fl. 23: 220. 1930. (T.: *Tonduz 7012!*).

Copaifera hemitomophylla Donn. Sm. in Bot. Gaz. 27:332. 1899.

Tree. Branchlets zig-zag, nodose or gnarled, glabrous, the lenticels numerous, small, and verrucose. Petioles 0.6–0.8 cm. long, glabrous. Leaflets elliptic, 9–14 cm. long, 3–5 cm. wide, obviously acuminate at apex, the wide side obtuse at base, the lamina reticulate, papillate (under mag.) especially above, the costa sub-prominent above, the secondary veins 15–20, curving arcuately near margin to join veins above, thin-coriaceous, inequilateral, curved falcately, glabrous. Bracts, bracteoles, and flowers not known. Rachises of racemes (in fruit) 0.5–1 cm. long, apparently solitary in the axil, glabrous. Pedicels 1–1.5 cm. long, 0.3–0.4 cm. wide, glabrous. Legumes suborbicular, 3–4 cm. long, up to 3.5 cm. wide, nuci-form, the surface crustose-granular, the excrescences deciduous, the wall of the pericarp up to 2.8 mm. thick.

COSTA RICA: LIMON: Río Reventazón below Cairo, *Standley & Valerio 48799* (US); Santo Domingo de Osa (Golfo Dulce), *Tonduz 9972* (MO, NY); Palmar Norte Río Terraba, *Paul & Dorothy Allen 5264* (MO).

C. hemitomophylla, with perhaps the largest leaflets of the New World cynometras (*C. hostmanniana* excepted), is unfortunately known only from fruiting material.⁶ The principal secondary veins of the leaflets are more numerous (15–20) than in any other species. Another character of especial interest is the glabrous pedicel of the fruit.

The local name of *C. hemitomophylla* is "Guapinol Negro" and the common name is "Cativo" (fide P. Allen, loc. cit.).

6. *CYNOMETRA TRINITENSIS* Oliver, in Hook. Ic. 2443. 1896.

Small tree. Branchlets smooth, glabrous or puberulent, the lenticels inconspicuous. Petioles 0.6–1 cm. long, puberulent; petiolules 1–2 mm. long. Leaflets obliquely ovate or oblong, 5–11 cm. long, 1.5–4.5 cm. wide, vaguely to obviously acuminate at apex, tapering acutely or cuneately on wide side, the costa prominent, the secondary veins 10–12, prominulous, the lamina inequilateral, coriaceous, smooth or rugulose above and below, lustrous, glabrous, obviously inequilateral, the intervenal areas rather indistinct above. Bracts rotund to ovate-lanceolate, 3–6 mm. long, 1.5–3.5 mm. wide, densely puberulent dorsally; bracteoles oblong, up to 4.2 mm. long, 0.5–0.8 mm. wide, carinate and densely puberulent dorsally. Racemes 1–3 per axil, the rachises 0.8–1 cm. long, puberulent, the flowers about 15 per rachis, the pedicels up to 0.8 cm. long. Sepals usually 4, oblong to sub-rotund, 3–3.5 mm. long, 1.5–3 mm. wide, puberulent dorsally at apex and base; petals lanceolate to oblong-lanceolate, 4–5.8 mm. long, 1.3–2 mm. wide, tapering toward base; filaments 4.5–6 mm. long, the anthers 0.6–0.9 mm. long; ovary

⁶ Paul Allen writes (*The Rain Forest of Golfo Dulce Costa Rica* p. 191. 1956), that the flowers of *C. hemitomophylla* are "pale-brown [and] are produced from late August to nearly November."

oblong, about 2.5 mm. long, about 1.5 mm. wide, villose especially basally and on sutures, the hairs scattered on valves, the style 4–5 mm. long. Legume rotund, 2–4 cm. long, 2–4 cm. wide, the pericarp smooth, minutely granulose or crustulose, 2–2.5 mm. thick.

JAMAICA: Castleton Garden, collector ?, collection no. 11 (NY).

TRINIDAD: Botanical Garden, collector ? (G); Government House grounds, Broadway s. w. (NY, US, P); Botanical Garden, Britton 1183 (NY, US).

BRITISH GUIANA: Botanical Garden, Georgetown, collector ? (BRG).

C. trinitensis bears a striking resemblance to the Costa Rican *C. hemitomophylla* which unfortunately is known only from fruiting material. The principal secondary veins of the leaflets of *C. hemitomophylla*, however, are more numerous and proximate. The densely flowered and compressed racemes resemble those of *C. retusa*. The latter species, however, has more narrow leaflets, a shorter rachis, apparently longer sepals, and a densely hirsute ovary. The reduction in the number of hairs on the ovary is the most conspicuous floral character of *C. trinitensis* and is unique for the New World cynometras, *C. fissicuspis* and possibly *C. stenopetala* excepted. In the plate accompanying the original description this character was not accurately depicted despite the reference in the text to "ovario parce piluloso."

The type collection (obviously from Trinidad) was not located. Oliver, following the original diagnosis, states: "Trinidad, Crueger, Prestoe etc." Whether the species is native to Trinidad is not certain.

7. *CYNOMETRA hondurensis* Dwyer, sp. nov. (T.: Schipp 1192 (A)!).

Arbores parvae. Ramuli laeves glabri saepe lenticellis inconspicuis. Folia glabra. Petioli 0.6–0.8 cm. longi. Foliola sessilia anguste oblongo-lanceolata, 6–12 cm. longa, 1.8–4.5 cm. lata, apice plerumque attenuato-acuminata, acumine circ. 1 cm. longo saepe subfalcate disposito, ultime emarginato, subequilateralia vel evidenter inequilateralia latere lato basi cuneata, latere angusto attenuato, costa supra prominula infra subprominente, venis secundariis principalibus \pm 15 prominulis, laminis reticulis tenui-coriaceis vel rigide chartaceis supra in siccitate obscure olivaceis. Racemi compressi, rhachidibus (hic alibus in fructu) 0.8–2 cm. longis, circ. 0.12 cm. latis puberulis. Bractee bracteolaeque non visae. Sepala 4, oblonga, 2.5–3.8 mm. longa, 1–1.8 mm. lata, acuta vel acuminata (rare obtusa) omnino glabra praeter dorso basim puberulo; petala alba in vivo, anguste ovato-lanceolata vel angusto-oblonga, 3.2–4.6 mm. longa, 0.8–1 mm. lata, acuminata vel vix obtusa; antherae non visae; ovaria omnino pubescentia comis aliis appressis, valvis oblongis, 2.3–2.5 mm. longis, 1.5–1.8 mm. latis, stylo circ. 2.5 mm. long. Legumina (hic juvenilia) impare obovato-oblonga, 2.3 cm. longa, 1.5 cm. lata, apiculata compressa minute crustulosa.

BRITISH HONDURAS: Rio Grande River, Schipp 1192 (A, G, MO, NY).

The foliage of the new species closely resembles that of *C. retusa* and *C. schottiana*, differing from the former in having only thin-coriaceous or stiff-chartaceous leaflets, much longer rachises of the inflorescences, longer petals, and larger and

more compressed fruits. *C. schottiana* on the other hand, has much larger and more numerous flowers, shorter rachises of the racemes, more elongate pedicels, and sepals with hairs restricted marginally. Like *C. retusa*, the new species bears apiculate fruits.

8. *CYNOMETRA SCHOTTIANA* Hochr. in Bull. N. Y. Bot. Gard. 6:275. 1910. (T.: *Schott XII 857!*).

Tree. Branchlets glabrous, the lenticels obvious and numerous. Petioles 0.6–1 cm. long, glabrous. Leaflets oblong to oblong-lanceolate, 8–13 cm. long, 3–5.5 cm. wide, the acumens up to 1.5 cm. long, obtuse to subauriculate on wide side at base, the costa subprominent, the secondary veins up to 20, prominulous, uniting near margin to form an undulating vein subparallel to margin, the lamina scarcely stiff-chartaceous, obviously inequilateral, glabrous. Bracts ovate or oblong, puberulent dorsally; bracteoles not seen. Racemes apparently one per axil, the rachises 0.2–0.3 cm. long, puberulent, about 3-flowered. Sepals 4–5 (often two almost completely united marginally), oblong-lanceolate to oblong, 4–5.3 mm. long, 1.8–2.8 mm. wide, glabrous except puberulent marginally; petals lanceolate, 6–7 mm. long, about 2 mm. wide, acute to acuminate at apex; filaments up to 9 mm. long, the anthers about 1 mm. long; ovaries densely pubescent, the style 2–3.8 mm. long. Legume oblong (here very immature).

COLOMBIA: EL CHOCÓ: Atrato and Truando Rivers, *Schott XII 857* (NY).

The few-flowered racemes and the elongate petals exceeded in length only by those of *C. cubensis* and *C. cuneata*, are noteworthy. Hochreutiner in his original description erred in describing the sepals as glabrous. The common name is "Tremantino".

The type collection in New York bears the collection number "*XII 857*" and not simply "7" as listed by Britton & Killip (Ann. N. Y. Acad. Sciences 35:193. 1936).

9. *CYNOMETRA MARGINATA* Benth. in Hook. Lond. Jour. Bot. 2:100. 1840.

Tree. Branchlets rough, usually conspicuously lenticellate, glabrous to puberulent. Petioles up to 3.5 mm. long, glabrous to puberulent. Leaflets sessile, oblong, sub lanceolate or narrow elliptic, 4–7 cm. long, 1.5–3 cm. wide, scarcely attenuate to acuminate, emarginate, the wider side subauriculate to scarcely obtuse at base, the costa prominulous above and below, the principal secondary veins 10–15, immersed to prominulous above, prominulous to subevanescent below, the lamina thin-coriaceous, inequilateral to subequilateral, minutely papillate to rugulose above and below, reticulate, glabrous, the margin often thin-callose, occasionally crisp. Bracts oblong, up to 2 mm. long, densely pubescent on back. Bracteoles oblong, up to 1.5 mm. long, obviously carinate, the hairs elongate along carina. Racemes 1–2 per axil, the rachises 0.2–1.8 cm. long, 8- to 15-flowered, densely aureo-puberulent, the pedicels 0.5–1 cm. long, about 0.35 mm. wide (at anthesis), puberulent. Sepals 3–4, often 2 united marginally, almost completely or only to middle, ovate-oblong,

oblong-rotund to narrowly ovate-oblong, 2.5–6.5 mm. long, 2–5 mm. wide, obtuse to subacute at apex, puberulent to scattered-villose on back, the hairs often confined below middle; petals narrow-lanceolate to narrow-oblong, 3.5–7 mm. long, 1–3.5 mm. wide, acuminate to obtuse at apex, obtuse to somewhat clawed at base; filaments of stamens up to 13 mm. long; the anthers 0.6–1.1 mm. long; ovary oblong, up to 3 mm. long, densely hirsute, most hairs elongate and ascending, some shorter and more flaccid, the style 2.8–4 mm. long. Legume oblong, up to 2 cm. long, vaguely rugulose to somewhat smooth, crustulose, the pericarp about 1 mm. thick.

KEY TO THE VARIETIES

Leaflets obviously reticulate.

Leaflets oblong, sub lanceolate or narrow-elliptic, scarcely acuminate, coriaceous.....

.....9a. *C. marginata* var. *marginata*.

Leaflets elliptic, obviously acuminate, the acumen 1–1.5 cm. long, chartaceous.....

.....9b. *C. marginata* var. *guianensis*.

Leaflets smooth and not reticulate.....

.....9c. *C. marginata* var. *laevis*.

9a. *CYNOMETRA MARGINATA* VAR. *MARGINATA*.

PANAMA: Savanna north of Panama City, *Brother Paul* 463 (F); Paraíso Station, *Hayes* 29 (K).

SURINAM: without specific locality, *B. W.* 658 (U); Forest Reserve Section, *B. W.* 1257 (U); Kaborie, *B. W.* 4885 (K, NY, U); Sectie O, *B. W.* 5868 (MO, U); Sectie O, *B. W.* 6086 (U); Tibiens River, *Tresling* 300 (U); Coppename River near Raleighfalls, *Lanjouw* 858 (MO, U); Surinam River near Kabel, *Lanjouw* 1219 (K, NY); Marowijne River, *Lanjouw & Lindemann* 2964 (U); Saramacca River Headwaters, *Maguire* 23906 (NY); Boachland, Saramacca River, village Jacob Kondre, *Maguire & Maguire* 23856 (F, MO, NY, V); Posoegronoe, Saramacca River, *Maguire & Maguire* 24040 (MO, NY, U); Boaschland, *Maguire* 24040a (U, V).

BRITISH GUIANA: *British Guiana Forest Dept.* 6217 (NY, U).

VENEZUELA: Río Orinoco between mouth Río Atabapo and Cano Masagua, *Level* 89 (NY); BOLÍVAR: Cerro Guaquinima, 1 mile above Raudal Aquacanta, *Maguire* 32705 (NY, V); Laguna de los Chivos (Municipio Upata), *Delgado* 216 (V).

BRAZIL: PARÁ: without specific locality, *Schomburgk* 197 (169) (F, K, V, W); Remansao, Tocantins, *Froes* 23600 (NY); Rio Capim between Aproagu and Igarapé Canduru; Rio Tapajoz, *Ducke* 16898 (R).

C. marginata is apparently the most difficult of all the New World cynometras to circumscribe because of the variability of its leaflets, which are typically thin-coriaceous, narrowly lanceolate, and scarcely attenuate apically. While the minutely papillate laminae furnish a character permitting one to segregate it from its ally, *C. spruceana*, nevertheless, other foliage characters are not stable, viz. the reticulate surface and the prominulous character of the secondary veins. The rachises of the racemes are strikingly variable in length, apparently an unusual feature for the New World cynometras. Other characters, perhaps of secondary importance, are the occasional reduction of sepals to 2, occasionally glabrous sepals, and the variability in the length and width of the petals. The reduction in number of sepals to 2 is otherwise found only in the Mexican *C. oaxacana*.

9b. *CYNOMETRA MARGINATA* var. *guianensis* Dwyer, var. nov. (T.: *Schomburgk 777* (NY)!).

Foliola elliptica, 3–8 cm. longa, 1.2–3 cm. lata, conspicue attenuato-acuminata acumine 1–1.5 cm. longo, costa supra plerumque pubescente, chartacea, plerumque vix inaequilateralia.

SURINAM: Nicckerie, *Gongyryp & Stabel 1010* (U).

BRITISH GUIANA: without specific locality, *Richard Schomburgk s.n.* (G, U, W); *Richard Schomburgk 1533* (U); *Robert Schomburgk (Herb. Hance 7667)* (W); *Schomburgk 777* (NY, V, W).

VENEZUELA: BOLÍVAR: Alto Río Paragua, *Cardona 884* (US).

The Schomburgk collections of the new variety are recognized with ease inasmuch as the leaflets are strongly attenuate-acuminate and chartaceous. The material from Surinam and Venezuela was difficult to assign to this taxon.

9c. *CYNOMETRA MARGINATA* var. *laevis* Dwyer, var. nov. (T.: *Froes & Murça 24014* (NY)!).

Foliola laevia nitida venis secundariis supra evanescentibus. Fructus globosi suturis conspicuis.

BRAZIL: PARÁ: Rio Capini between Aproaga and Igarapé Candiri, *Froes & Murça 24014* (NY).

The glossy leaflets with the secondary veins scarcely visible mark the new variety. The fruit is more rotund than in *C. marginata* var. *marginata*. It is difficult to say whether the conspicuous sutures of the valves represent a substantial distinguishing character inasmuch as fruiting material of *C. marginata* is so poorly represented in herbaria.

10. *CYNOMETRA OAXACANA* Brandgee, in Univ. Cal. Publ. Bot. 6:180. 1915. (T.: *Purpus 7383*!).

Cynometra colimensis Britton and Rose, N. Am. Fl. 23: 220. 1930. (T.: *Ferris 6237*!).

Shrub to large tree. Branchlets glabrous or puberulent, the lenticels prominent. Petioles about 0.5 cm. long, glabrous. Leaflets obliquely ovate-oblong, ovate-lanceolate, rarely oblong-subrotund or narrow-oblong, 3.5–8 cm. long, 1.5–5 cm. wide, obtuse on wide side at base, the costa prominent or prominulous, the secondary veins ± 10 , prominulous, the lamina vaguely to obviously papillate above (sub mag.), reticulate above and below in thinner more mature leaves, thin-coriaceous, very inequilateral, glabrous. Bracts oblong to ovate-oblong, 2.5–3 mm. long, up to 3 mm. wide, puberulent dorsally and marginally; bracteoles located about 1 mm. from base of pedicel, oblong, up to 2 mm. long, carinate, scattered pubescent on back. Racemes one to 3 per axil, the rachises 0.5–2 cm. long, ± 8 -flowered; pedicels 0.6–1.2 cm. long, densely aureo-pilose; sepals 2–5, often a pair fused below middle, oblong, ovate-oblong to ovate, 2.5–4 mm. long, 1.2–3 mm. wide (or up to 4 mm. wide if 2 fused), glabrous or puberulent dorsally; petals oblong to obovate-oblong, 3.5–5 mm. long, 1–1.6 mm. wide, often subfalcately

disposed, obtuse to vaguely clawed at base; filaments up to 7 mm. long, the anthers subrotund, 0.7–1 mm. long, 0.6–8 mm. wide; ovaries obliquely oblong to subrotund, 3–4.5 mm. long, 2–2.5 mm. wide, densely pilose, style up to 3.5 mm. long, subcrassate, glabrous to pilose above middle. Legume oblong, up to 3 cm. long, up to 1.6 cm. wide, minutely granulose or crustulose, the wall of the pericarp up to 0.5 mm. thick.

MEXICO: without locality, *Hinton* 10893 (U); COLIMA: Manzanillo, *Ferris* 6188 (US), 6237 (A, NY); GUERRERO: La Lagunilla, *Nelson* 7004 (US); Zihuatanejo, *Langlassé* s. n. (P), *Langlassé* 441 (F, G, US); OAXACA: Cerro de Picacho, *Purpus* 7383 (F, LA, MO, NY); CHIAPAS: Aguacate Palenque, *Matuda* 3796 (F, NY).

Two characters mark *C. oaxacana*: the oval-oblong or ovate-oblong leaflets scarcely acuminate at the apex and the reduction in the number of the sepals (2–3). Some of the smaller leaflets of *Purpus* 7383 (MO) have a thick lamina which is not obviously papillate and reticulate below, thus differing markedly from the larger leaflets. A similar variation in the thickness, surface character, and venation of the leaflets on a single collection (*Spruce* s. n. (K), type of *C. spruceana* var. *spruceana*) was encountered.

11. *CYNOMETRA CRASSIFOLIA* Benth. in Hook. Lond. Jour. Bot. 2:100. 1840.

Small tree. Branchlets often wiry and zig-zag, angular in cross-section, rough or smooth, glabrous or puberulent. Petioles 0.4–0.8 cm. long, slender, glabrous or puberulent. Petiolules up to 0.1 cm. long. Leaflets oblong-lanceolate, ovate-lanceolate, rarely subtrapezoid, 3.6–9 cm. long, 1.5–4 cm. wide, short-acuminate at apex, the wide side obtuse or tapering narrowly at base, the costa prominulous, glabrous to puberulent, the secondary veins prominulous, the most basal 1 or 2 strict and spreading flabellately, the upper arcuate-ascending, plane or prominulous above, prominulous and conspicuous beneath, the lamina minutely papillate above and below, reticulate, subcoriaceous or stiff-chartaceous, inequilateral, the wide side usually thrice the diameter of the narrow side, glabrous above, glabrous or puberulent below. Bracts ovate to subrotund, up to 2 mm. long; bracteoles not seen. Racemes solitary in the axils, the rachises up to 0.5 cm. long 8- to 10-flowered. Pedicels 0.6–1.2 cm. long, about 0.7 mm. wide in middle. Sepals 4, ovate to oblong, 2.5–3.5 mm. long, 1.3–2.8 mm. wide, puberulent dorsally; petals narrow-oblong, narrow-lanceolate to obovate-oblong, 4.5–5.2 mm. long, 1.2–1.6 mm. wide, obtuse to somewhat clawed at base; filaments up to 8 mm. long, the anthers oblong, about 0.6 mm. long; ovaries obliquely oblong, completely pubescent. Mature legumes not seen.

BRAZIL: locality and collector unknown (P, probable type); without specific locality, *Geoffrey* (?) s. n. (P).

ECUADOR: MANABI: Recreo, *Eggers* 15752 (F, US); ORO: Piedras, *Little* 6622 (US).

In the herbarium in Paris I located a specimen labeled *Cynometra crassifolia* Benth. ex ipso Brésil. This is probably the type inasmuch as Bentham, in describing *C. crassifolia*, stated that "I have seen the three following American species in the Paris Herbarium" (including *C. crassifolia*).

12. *CYNOMETRA stenopetala* Dwyer sp. nov. (T.: *Krukoff 6631* (NY)!).

Arbores 18–30 m. altae. Ramuli laeves glabri. Petioli 2–5 mm. longi, marcescentes glabri. Foliola 2 sessilia inaequilateralia vix falcata oblique oblongo-lanceolata vel oblonga, 3–8 cm. longa, 1–3.3 cm. lata, breviter acuminata retusaque, latere angusto gradatim attenuato, latere lato obtuse disposito, costa utrimque subprominente glabra, venis secundariis principalibus 10–12 prominulis vix ascendentibus ultime venam marginalem conspicuam dispositis, coriacea laevia brunnea glabra?. Racemi fasciculati rhachidibus plerumque pluribus per axillam, 1–7 (–10) mm. longis. Bractae crebrae mox deciduae ovatae vel ovato-rotundae intus glabrae extus puberulentes. Bracteae oblongae, circ. 2.5 mm. longae, 0.5 mm. latae, carinatae dorso ciliatae infra medium pedicellorum affixae. Flores 4–10 per rachidem. Pedicelli (hic in fructu) circ. 6.5 mm. longi, circ. 0.8 mm. lati, lignosi. Sepala 4, oblonga vel ovata-oblonga, 2–3 mm. longa, 0.9–2 mm. lata, obtusa glabra praeter dorso marginibusque; petala lanceolata, circ. 2.8 mm. longa, circ. 1 mm. lata, acuta basi subspathulata glabra; stamina 10, filamentibus vix basi cohaerentibus, ad 6.5 mm. longis, circ. 0.1 mm. latis, antheris non visis; legumina turgida subrotunda, ad 1.3 cm. longa, in forma nuculae constructa suturis copiose aliter sparse pubescentibus, crustulosa vel granulosa pericarpio spongioso, ad 3 mm. crasso, seminibus solitariis loculum expletibus.

BRAZIL: AMAZONAS: Humayata near Livramento on Rio Livramento, *Krukoff 6631* (A, NY, U, US); Humayata near Tres Casas, *Krukoff 6439* (A, F, NY, US); São Paulo de Olivença near Palmares, *Krukoff 8418* (U).

All of the specimens are in the late flowering or juvenile fruit stage. Fortunately sepals and to a less extent, petals may be found after a careful search. The petals, not exceeding 2.8 mm. in length are smaller (2–3 mm.) than those of any of the other New World cynometras except *C. baubiniaefolia* and *C. microflora*. On the basis of leaflet venation, however, the species appear unrelated, inasmuch as *C. stenopetala* has the principal secondary veins on the wider side of the lamina regularly spaced, while *C. baubiniaefolia* and *C. microflora* have the lowermost 2 or 3 secondary veins flabellately disposed. Vegetatively the new species appears to be closely related to *C. spruceana*. The short-pedicelled flowers borne on short rachises scarcely resemble the long-pedicelled flowers of *C. spruceana* which are disposed in lax racemes on relatively elongate rachises. *C. stenopetala* seems to be more closely related to *C. marginata* and to *C. crassifolia*; it is readily distinguished from these by its more coriaceous leaflets, smaller sepals and petals, and the ovary (judging from the condition of the juvenile fruit) presumably bearing only few hairs on the valves. Reduction in the number of ovarian hairs is elsewhere encountered only in *C. trinitensis*.

13. *CYNOMETRA CUNEATA* Tul. in Arch. Mus. Paris 4:179. 1844. (T.: *Richard s. n.!*).

Tree. Branchlets smooth, drying silver-brown, puberulent, the lenticels inconspicuous. Petioles 0.5–1.8 cm. long, crassate, glabrous. Leaflets rhomboid-

ovate to elliptic-lanceolate, 6–11 cm. long, 2.3–4.3 cm. wide, the acumen up to 1.2 cm. long, or short-acuminate to almost obtuse, obviously obtuse at base on wider side, the costa prominulous above, usually rather prominent beneath, glabrous, the principal secondary veins ± 15 , very prominulous but rather evanescent above, prominulous beneath, the margin thin-callose, the lamina thin-coriaceous, minutely papillate above and below, scarcely to obviously inequilateral, obviously reticulate below, glabrous. Bracteoles narrow-oblong, up to 3 mm. long, puberulent on back, attached basally. Racemes prominent, usually one per axil, the rachises slender, 2–3.5 cm. long, 10- to 20-flowered, puberulent, the pedicels 0.8–2 cm. long, about 0.5 mm. wide (up to 1.5 mm. wide in fruit), scarcely pubescent, smooth, rubescent. Sepals oblong, 4–5.5 mm. long, 2–2.8 mm. wide, obtuse, glabrous except for few scattered hairs at apex; petals lanceolate to obovate-oblong, 7–7.5 mm. long, 1.6–2.2 mm. wide, acute to obtuse at apex; filaments up to 9 mm. long, the anthers 0.8–1 mm. long; ovary oblong, about 3.5 mm. long, about 2.2 mm. wide, the hairs dense, appressed, sericeous. Legumes oblong, up to 3.3 cm. long, up to 1.5 cm. wide, plump, finely rugulose, crustulose or minutely papillate, velutinous at first, then glabrate or glabrous.

VENEZUELA: BOLÍVAR: Raudal Arutani, Alto Paragua, Guayana, Cardona 865 (V).

BRAZIL: PARÁ: without specific locality, Richard s. n. (P); Juruá, Ducke 16894 (K, US); Belém do Pará, Ducke 20208 (US); Caracari, Rio Branco, Kuhlmann 1067 (R); RIO DE JANEIRO: without specific locality, Glaziov 13756 (G).

The relationship of *C. cuneata* and *C. spruceana* is suggested by their similar foliage. *C. cuneata*, however, has longer petioles, often rhomboid-ovate leaflets which are papillate and bear prominulous secondary veins. Likewise the rachises and pedicels are longer, the flowers more numerous and the petals longer, thus suggesting closer relationship with *C. longifolia*. Unlike *C. spruceana* the bracteoles are attached basally. The uniformly appressed hairs of the ovary are unique among the New World cynometras.

14. *CYNOMETRA SPRUCEANA* Benth. in Mart. Fl. Bras. 15(2):247. 1876. (T.: *Spruce* s. n. ?)

Small trees; branchlets smooth, glabrous to puberulent; petioles 2–7 mm. long, usually puberulent; petioles absent or up to 1 mm.; leaflets narrow-oblong, subovate-oblong to obovate oblong, 2–8.5 (10) cm. long, 1–4 cm. wide, vaguely to obviously acuminate at apex, ultimately emarginate, oblique at base, the wider side tapering obtusely, or subtruncate at base, the narrow side acute (tapering usually beginning near middle part of blade), the costa plane to prominulous above, often with groove on each side, prominulous below, the secondary veins scarcely prominulous to plane or immersed (?) above, the margin regular, occasionally revolute, thin to moderately thick-coriaceous, obviously inequilateral, rugulose, often obviously reticulate below; racemes usually 1–2 per axil, the rachis slender, puberulent, 0.7–2 cm. long, (6-) 10- to 15-flowered, the pedicels filiform (about 0.5 mm. wide), 0.5–2 cm. long, densely puberulent; bracts soon deciduous, oblong-rotund to rotund, up to 5 mm. long and 5 mm. wide, densely or moderately

puberulent on back and margins; bracteoles deciduous, up to 3 mm. long, densely puberulent on back, carinate, thickened apically, the bracteole scars 2–5 mm. above proximal end of pedicel; sepals 4 (or 3 by fusion of 2), oblong, ovate-oblong to subrectangular, 3–4.8 mm. long, 1–2.3 (–3) mm. wide, obtuse to subacuminate at apex, usually obviously puberulent on back, often ciliate on margins; petals oblong to obovate-oblong, 5–7.5 mm. long, 1.8–2.3 (–3.2) mm. wide, obtuse to acuminate at apex, vaguely to obviously clawed at base; filaments 5–10 mm. long, the anthers 0.9–1.3 mm. long, 0.5–0.7 mm. wide; ovaries oblique-oblong, 2–3.8 mm. long, 1–2 mm. wide, densely pubescent, the style up to 5 mm. long; legume oblong to subrotund, 2.5–3 cm. long, 1–1.5 cm. wide, the suture of valves distinct, plump, obviously rugulose, minutely granulate and puberulent.

KEY TO THE VARIETIES

- Leaflets conspicuously or only vaguely acuminate at apex.....14a. *C. spruceana* var. *spruceana*.
 Leaflets obviously obtuse at apex.....14b. *C. spruceana* var. *phaeolocarpa*.

14a. CYNOMETRA SPRUCEANA var. SPRUCEANA.

Trachylobium martianum Hayne, in Flora 10(11):744. 1827.

Cynometra spruceana var. β *procera* Benth. in Mart. Fl. Bras. 15²:248. 1876. (T.: *Spruce* 3479!).

Cynometra spruceana var. γ *macrophylla* Benth. in Mart. Fl. Bras. 15²:248. 1876. (T.: *Spruce* 513!).

Cynometra martiana (Hayne) Macbr. in Contr. Gray Herb. 59:19. 1919.

BRITISH GUIANA: without specific locality, *Schomburgk* 197 (168) (W).

VENEZUELA: BOLÍVAR: Laguna de los Chivos (Municipio Upata), *Delgado* 216 (G, US); *Pittier* 216 (G); AMAZONAS: Cano Macasi, Capihuara, Alto Casiquiare, *Llewellyn Williams* 15593 (US, V).

COLOMBIA: Río Apaporis between Río Pacoa and Río Kananari, *Schultes & Cabrera* 12616 (US).

BRAZIL: AMAZONAS: Barra, Rio Negro, *Spruce* 1513 (K, W); San Carlos, Rio Negro, *Spruce* 3479 (NY, P, V, W). MARANHÃO: Pedreiras, *Ducke* 2320 (G, US); Manaus, *Schwacke* 358 (US); Igarapé de Cachoeira Grande, *Ule* 8864 (G, NY, U, US), *Ducke* 719 (MO, US), *Ducke* 24248 (U, US); Igarapé de Marapata, *Ducke* 24247 (U). PARÁ: without specific locality, *Spruce* s. n. (NY, P, W); Lago de Faro, *Ducke* 8412 (G, US); Esposente municipio Almeirim, *Ducke* 3549 (G); Santarem, Alter do Chao, *Ducke* 10820; Bas Xingú, Victoria, *Snetblage* 10408 (G); Santarem, *Spruce* 872 (K, P); Belém, S. forest of I.A.M., *Archer* 7906 (F, K), 7943 (F), 8087 (US); Conceicas perto da Fóz do Rio Juruena, *Pires* 3912 (NY); Cachoeira do Rio Arua, *Pires & Silva* 4210 (NY); Rio Tucuruhy near Rio Xingú, *Kuhlmann* 17655 (G, P, U, US).

PERU: LORETO: Mishuyaca, Iquitos, *Klug* 1448 (F, NY, US); Marañón, Iquitos, *Tessmann* 3636 (F, G).

In 1919 Macbride effected the combination *Cynometra martiana* (Hayne) Macbr. maintaining that Baillon's earlier combination *Cynometra martiana* (Hayne) Baillon is untenable inasmuch as "it is a valid species of *Hymenaea* (*H. martiana* Hayne)." According to Macbride, Hayne's specific name *martiana* may be used for the "species of *Cynometra* which has heretofore borne the later published name of *C. spruceana*." No doubt he bases this on the fact that the plate in Hayne's *Arzneigew* (11: pl. 17. 1839), labeled *Trachylobium martianum* is a *Cynometra*.

However, the binomial *C. martiana* (Hayne) Macbr. is illegitimate, being a homonym of *C. martiana* (Hayne) Baillon which is applied to a valid species of *Hymenaea*. That this name has not been applied in the past to a *Cynometra* but to a species of *Hymenaea* makes no difference, the binomial *C. martiana* being already published.

After examination of type collections of Bentham's two varieties, β *procera* and γ *macrophylla*, I am unable to find any strong characters to substantiate giving them varietal status. Examination of the type material of var. *procera* deposited in Vienna shows leaflets of obviously different ages; the more mature leaflets are thicker with the secondary veins immersed above, and the venules inconspicuous beneath, while the more juvenile leaflets are obviously more reticulate beneath with the secondary veins prominent above. Since Bentham distinguishes var. *procera* by "foliolis quam in forma typica minus coriaceis," it seems unwise to recognize this variety without additional supporting collections. As for var. *macrophylla*, the type collection deposited in Vienna has leaflets which are less elongate than those described by Bentham ("3-4 pollicaribus"); another character used by Bentham, the length of the racemes and the pedicels, is so variable in the typical material that it cannot be regarded as a strong one.

While the pedicels and rachises of the racemes are constantly filiform, there is considerable variation in their length; *Tessmann* 3636, for example, has elongate rachises but relatively short-pedicelled flowers; *Ule* 8864 has both elongate rachises and elongate pedicels; *Pittier* 216 has both short rachises and short pedicels.

Two excellent plates of *C. spruceana* are available, one in Hayne's *Arzneigew* 11: pl. 17. 1830, and the other in *Martius Flora Brasiliensis* 15²:247. pl. 65. 1876.

14b. *CYNOMETRA SPRUCEANA* var. *phaselocarpa* (Hayne) Dwyer, comb. nov.

Vouapa phaselocarpa Hayne, in *Flora* 10(11):745. 1827.

Cynometra racemosa Benth. in *Hook Lond. Jour. Bot.* 100. 1840. (T.: *Spruce s. n.*)

Cynometra obtusa Benth. in *Pl. Spruce exs. Nomen.*

Cynometra phaselocarpa (Hayne) Macbr. in *Contr. Gray Herb.* 59:19. 1919.

BRAZIL: AMAZONAS: Barra, *Spruce* 1428 (K); Barra, Rio Negro, *Spruce s. n.* (F, NY, P, U, W); Santa Izabel, *Ducke* 509 (A, NY, MO, US), 35415 (G, P, U, US); Manaus, Rio Tarumá, *Ducke* 676 (F, MO, US), *Ducke* 1010 (MO, US).

The obtuseness of the apex of the leaflets does not seem to be sufficient grounds to warrant the retention of *C. phaselocarpa* as a distinct species. In all other respects it bears a striking resemblance to *C. spruceana* var. *spruceana*, especially in the character of the lax racemes with elongate rachises and filiform pedicels. *Ducke's* collection 676 is important inasmuch as it bears legumes. The common name of the variety is "jutahy-rana" (fide *Ducke*).

15. *CYNOMETRA LONGICUSPIS* *Ducke*, in *Bol. Técn. do Instit. do Norte.* 2:11. 1944. (T.: *Ducke* 1593!).

Medium-sized trees. Branchlets terete, ultimately angular and arcuate, smooth, glabrous, drying purple to ashen-white. Petioles up to 8 mm. long, about 1.5 mm.

wide, slender, glabrous to scattered-puberulent; petiolules 0.5–1 mm. long. Leaflets oblong, up to 8 cm. long, up to 3 cm. wide, the acumen up to 1 cm. long, about 2.5 mm. wide in middle, ultimately emarginate, the sinus about 0.5 mm. deep, obtuse at base on wider side, the costa prominulous above and below, the secondary veins ± 10 , immersed or plane, not markedly arcuate-ascending, the ultimate reticulations evanescent, the lamina coriaceous, lustrous above and below, rugulose above and below (sub mag.), inequilateral, glabrous (except possibly on costa); inflorescences, bracts, bracteoles and complete flowers not seen. Sepals (one seen) suboblong, 4 mm. long, about 1.3 mm. wide, glabrous; petals not seen; filaments (two seen) linear, about 7 mm. long, the anthers not seen; rachis of fruit woody, 2–5 mm. long, about 1.8 mm. wide, ligneous, glabrous. Pedicels ± 5 mm. long, somewhat smooth, apparently glabrous; legume obliquely oblong to oblong-rotund, up to 8 mm. long, up to 6 mm. wide, plump puberulent, rough and crustulose, the stipe up to 1.5 mm. long.

BRAZIL: AMAZONAS: Tocantins beyond Villa Velha, *Ducke 15,3* (F, NY).

Ducke in his brief diagnosis of this species related it to *C. baubiniaefolia* and to *C. spruceana*. He mentions the "poor fragments of old flowers [which] do not show differences from those of the widely distributed *C. baubiniaefolia*." A study of the type material suggests that *C. longicuspis* is probably closely related to *C. spruceana*. The fruits of the latter species are more rugose.

Ducke states (loc. cit.) that it is a rather large tree found in very humid places at Tocantins and São Paulo de Olivença, at São Gabriel and its tributary, Rio Vaupes.

Two collections made by Froes (22147 and 20723), labeled *C. longicuspis*, are obviously misidentified. The former collection (in fruit) appears to be a *Peltogyne*.

16. *CYNOMETRA LONGIFOLIA* Huber, in Bol. Mus. Goeldi 5:384. 1908. (T.: *Ducke 9083!*).

Tree? Branchlets zig-zag, subterete, puberulent; the lenticels conspicuous. Petioles up to 0.7 cm. long, puberulent. Leaflets narrow-oblong, 7–12 cm. long, 2.5–2.8 cm. wide, tapering into an obvious acumen (up to 1 cm. long), subauriculate at base on wider side, the costa prominulous above, glabrous (except hairs occasionally scattered on under surface), lowermost pair of secondary veins usually arising sharply from one point at base of costa, the others well-spaced along length, prominulous to evanescent above, prominulous below, the lamina rugulose (under mag.), coriaceous, inequilateral, glabrous (except costa beneath). Bracts ovate, up to 5 mm. long, occasionally wider than long, often persistent, pubescent dorsally, the marginal hairs often tufted; bracteoles oblong, up to 6 mm. long, about 1 mm. wide, located near middle of pedicel, the hairs ferrugineous, more dense along median axis, tufted apically, the pedicels slender, about 1 cm. long, about 0.5 mm. wide. Racemes apparently solitary in the axils, the rachises up to 6 cm. long, up to 2 mm. wide, ferrugineo-villose, 30- to 50-flowered; sepals 4, widely to narrowly

oblong, 3–4 mm. long, 2–3 mm. wide, puberulent on outside especially below middle; petals lanceolate, 4–4.8 mm. long, 1.3–1.4 mm. wide, acuminate; filaments up to 8 mm. long, the anthers about 1 mm. long; ovaries (here in young fruit) about 4 mm. long, about 2.7 mm. wide, pilose. Fruit oblong, up to 2 cm. long, up to 1.4 cm. wide, obviously rugulose.

BRAZIL: PARÁ: Santarem, *Spruce s. n.* (W); Rio Mapuera, Maloquinha, *Ducke 9083* (G).

C. longifolia is obviously related to *C. spruceana* as evidenced by its narrowly oblong leaflets rugulose above, elongate rachises of the racemes, filiform pedicels, and bracteoles attached near the middle of the pedicels. It is readily distinguished by its large leaflets, persistent bracts, unusually elongate rachises, and multi-flowered racemes.

Huber originally described the ovary as sparsely villose; my dissections indicate that it is densely villose.

17. *CYNOMETRA duckei* Dwyer, sp. nov. (T.: *Ducke 7165b* (G)!).

Arbores. Ramuli ultime puberuli cortice in siccitate cinereo. Petioli ad 0.2 cm. longi, glabri vel puberuli. Foliola sessilia oblique oblongo-rotunda vel semi-ovata, 0.7–2.5 cm. longa, 0.5–1.5 cm. lata, apice obtusa emarginata, basi latiore latere obtuso, costa supra prominula gradatim ad apicem evanescente infra plana, venis secundariis ± 10 supra inconspicuis lamina nullo modo reticulata vel papillosa (sub mag.) inaequilaterale latiore latere duplo triploque plure, margine evidenter calloso; bracteae, bracteolae, rhachides, flores non visa; pedicelli (hic fructuum) ad 1.5 cm. longi, pubescentes graciles. Legumina, subrotunda, 1.2 cm. longa, 1 cm. lata, turgida evidenter tuberculata vel rugosa crustulis parvis deciduisque ornata.

BRAZIL: AMAZONAS: Rio Negro, *Ducke 7165b* (G, US).

After considerable deliberation I have decided to describe this as a new species. *Ducke* labeled the material *C. parvifolia*. Its foliage bears a closer resemblance to that of *C. spruceana*, among the Amazonian species and, oddly enough, to *C. cubensis*. The leaflets are obviously much smaller and completely different in shape (due in part to the marked inequilateral condition) than those of *C. spruceana*. The most striking feature of the new species is the smoothness of the leaflets on the upper surface, with no evidence of these being reticulate or papillate; the secondary veins are scarcely visible and the costa tapers above the middle, disappearing toward the apex of the lamina. Only one legume was seen.

18. *CYNOMETRA BAUHINIAEFOLIA* Benth. in Hook. Lond. Jour. Bot. 2:99. 1840.

Shrub or tree. Branchlets smooth, glabrous to minutely puberulent, the lenticels conspicuous. Petioles 0.2–0.6 cm. long, glabrous to densely pilose. Leaflets obliquely ovate-oblong to ovate-lanceolate, 1–4 cm. long, 0.5–2 cm. wide, the costa prominulous above, the secondary veins 7–8, of these 2–3 obviously spreading

flabellately from base of costa on wide side and scarcely distinguishable from costa basally, the lamina reticulate, vaguely papillate to scarcely papillate below, thin-coriaceous, obviously inequilateral, glabrous to minutely puberulent. Bracts oblong to ovate, 1–2.3 mm. long; bracteoles oblong, up to 2 mm. long, carinate, densely pilose. Racemes compressed in axils, the rachises apparently usually several per axil, 1–4 mm. long, pubescent, usually 4- to 9-flowered; pedicels up to 7 mm. long, puberulent; sepals 3–4, widely oblong, ovate-oblong or obovate-oblong, 2.5–3 mm. long, 1–3.5 mm. wide; petals ovate to obovate-oblong, 2–3.6 mm. long, obtuse to acuminate at apex, obtuse to cuneate at base; filaments of stamens 4–9 mm. long, the anthers 0.5–0.7 mm. long; ovaries oblong to oblong-rotund, 2–3.5 mm. long, 1.5–2 mm. wide, completely pubescent, the style up to 5 mm. long. Legume oblong to subrotund, up to 2.5 cm. long, up to 2 cm. wide, rugulose or tuberculate, minutely and densely tomentose, the wall of pericarp up to 2 mm. thick.

KEY TO THE VARIETIES

Shrubs or trees; leaflets obviously reticulate, the margin not curled; flowers white.

Leaflets 1–4 cm. long, 0.5–2.0 cm. wide, glabrous to minutely puberulent on costa below;

petals up to 2.8 mm. long.....18a. *C. baubiniaefolia* var. *baubiniaefolia*.

Leaflets 4–6 cm. long, up to 3 cm. wide, completely puberulent; petals up to 5.5 mm. long.

.....18b. *C. baubiniaefolia* var. *grandiflora*.

Large trees; leaflets lustrous, not conspicuously reticulate, the margin obviously curled; flowers

yellow.....18c. *C. baubiniaefolia* var. *meridiana*.

18a. CYNOMETRA BAUBINIAEFOLIA var. BAUBINIAEFOLIA.

GUATEMALA: ALTA VERAPAZ: Río Ixvolay between Río Apia and Río Soctela, *Steyermark* 45034 (F).

SURINAM: without specific locality, *Schweintz* s. n. (NY); Commewijne, B. W. 1137 (U); Surinam River, *Mell* 17 (US).

BRITISH GUIANA: without specific locality, *Richard Schomburgk* s. n. (G, W); Pirara, *Schomburgk* 241 (W); Berbice, *Schomburgk* 230 or 231 (F, G, K, NY, W); Rio Essequibo, *Herb. N. Y. Bot. Gard. Field no. G 126, Record 6217* (NY); Essequibo River, *British Guiana Forest Service 6217* (G, NY, U), 6126 (G); banks of Cerenlyne Epiro, *Im Thurn* s. n. (K); Takutu River, S. Lethem, Rupununi District, *Irwin* 814 (US).

VENEZUELA: without specific location, *Maguire & Maguire* 4047 (K); BOLÍVAR: La Pargua, *Killip* 37611 (G, NY, US, V). AMAZONAS: El Bagre, Pto. Ayacucho, *Llewellyn Williams* 1307 (US).

COLOMBIA: Río Guaviare, San José del Guaviare, *Cuatrecasas* 7754 (US).

BRAZIL: without specific locality, *Newman* s. n. (G); *Burchell* 8830 (K); *Burchell* 9951 (NY, P); AMAZONAS: Jarú, Rio Branco, *Kublmann* 2919 (U, US, P); Rio Branco, S. Bento, *Ule* 7776 (G, K, US); Rio Branco, Faz. S. Bento, *Black* 51-13287 (US); Rio Sinho, Juruema, Rio Jutuhy, *Froes* 21043 (F, K, NY, US); Boa Vista, Rio Branco, *Ducke* 1355 (K, NY, (only part of sheet), US); Tefé, *Pires* 1327 (NY). PARÁ: Tapajoz, Boa Vista, *Capucho* 529 (F); Faz. Tuiuiu, Rio Arari, *Black, Ledaux & Stegemann* 52-14-284 (US). RIO DE JANEIRO: Quinta de São Christovao, *Glaziou* 18426 (P).

PERU: SAN MARTÍN: Ucayli, *Tessmann* 3444 (G, NY). LORETO: Río Haya, *Llewellyn Williams* 40 (F); Pro, Amazon River, *Llewellyn Williams* 1984 (A, F, US); Río Mazan near Iquitos, *Llewellyn Williams* 8142 (F).

ARGENTINA: CORRIENTES: Mercedes, *Rodrigo* 782 (NY).

CHILE: without specific locality, *McJohn Style* s. n. (G).

C. baubiniaefolia with the most extensive geographical range among the New World cynometras is readily recognized by the arrangement of the secondary veins

of the leaflets inasmuch as the lowermost 2 or 3 (on the wider side) arise flabellately from the proximal part of the costa. These are as prominent near their point of origin as the adjacent costa. A striking feature is the thick-walled fruit which is densely tomentose.

- 18b. *CYNOMETRA BAUHINIAEFOLIA* var. *grandiflora* Dwyer, var. nov. (T.: *Ducke 16896* (U)!)

Foliola ad 6 cm. longa, omnino puberula; petala ad 5.5 mm. longa.

BRAZIL: PARÁ: Botanical Garden, Belem do Pará, *Ducke 16896* (P, U, US).

The new variety is readily distinguished by its unusually large leaflets which are entirely puberulent. The flowers are strikingly large.

- 18c. *CYNOMETRA BAUHINIAEFOLIA* var. *meridiana* Dwyer, Var. nov. (T.: *Jorgensen 2124* (MO)!)

Foliola laevia nitida venis secundariis evanescentibus marginibus conspicue crispis; flores lutei.

ARGENTINA: Formosa, *Jorgensen 2124* (MO, U); Formosa, Río Coltapick, Colonia Herradura, Boca del Bermejo, *Pedersen 1295* (US).

19. *CYNOMETRA MICROFLORA* Cowan, in Mem. N. Y. Bot. Garden 8(2):114-115. 1953. (T.: *Maguire & Maguire 29010*!)

Small trees; branchlets glabrous to puberulent; petioles up to 3 mm. long; leaflets ovate-rotund or oval-lanceolate, up to 2 cm. long, up to 1.5 cm. wide, conspicuously obtuse above, more rounded (on wider side) basally, the secondary veins 3-4, prominulous, somewhat evanescent above, the lowermost pair arising flabellately from base of costa and resembling the latter, thin-coriaceous, glabrous, smooth, obviously inequilateral; racemes compressed, the rachises scarcely measurable, few-flowered; pedicels filiform, glabrous, up to 5 mm. long; sepals oblong, up to 2 mm. long, 1 mm. wide; petals lanceolate, 2-2.5 mm. long, up to 0.8 mm. wide; filaments up to 2 mm. long, the anthers up to 0.5 mm. long; ovary oval, up to 1.5 mm. long, densely puberulent, the style up to 2 mm. long; legumes oblong-lanceolate up to 1 cm. long, up to 0.6 cm. wide, somewhat rugulose, densely puberulent.

VENEZUELA: La Urbana, Orinoco River, *Maguire & Maguire 29010* (NY, V).

This species is very closely related to *C. baubiniaefolia* and may well be interpreted in the future as a variety of the same. Its small leaflets and flowers, as well as its glabrous pedicels distinguish it from its ally.

20. *CYNOMETRA PARVIFOLIA* Tul. in Arch. Mus. Paris. 4:181. 1844. (T.: *Hostmann 204*!).

Small or medium-sized tree. Branchlets smooth, densely puberulent. Petioles about 0.1 cm. long, densely pilose. Leaflets narrow-lanceolate, 1-1.8 cm. long, 0.2-1 cm. wide, the costa prominulous above, the secondary veins ± 7 , the lower-

most spreading flabellately from base of costa, prominulous but inconspicuous above, the lamina reticulate, rugulose (under mag.), thin-coriaceous or coriaceous, inequilateral, glabrous. Bracts compressed-rotund to ovate-oblong, up to 2 mm. long; bracteoles located at base of pedicels, oblong, up to 1 mm. long, carinate, the hairs few, deciduous; racemes compressed, axillary, the rachises up to 5 mm. long, densely pilose, the flowers 4–6 per raceme; pedicels 0.4–1 cm. long, ferrugineo-villose. Sepals 4–5, ovate-oblong, oblong-rotund or subrotund, 3–4.6 mm. long, 1–2.6 mm. wide, glabrous or puberulent dorsally and marginally; petals oblong to obovate-oblong, 3.5–4.6 mm. long, 0.8–1.8 mm. wide, glabrous, or often with several weak hairs at apex, obtuse or clawed at base; filaments 4–10 mm. long, the anthers oblong, 0.4–1 mm. long; ovaries oblique-oblong, 1.3–2.5 mm. long, 1–2.5 mm. wide, densely pilose, the style \pm 4 mm. long. Legume rotund, coccoid, up to 0.9 cm. long, 0.9 cm. wide, plump, the surface minutely crustulose, the wall of pericarp about 1 mm. thick.

SURINAM: without locality, *Hostmann* 204 (NY); Marowynne and Gonine Rivers, *Gonggryb* 3751 (U); Surinam River, *Kappler* 1905 (U); Marowynne River, *Lanjouw & Lindemann* 3471 (U).

BRAZIL: AMAZONAS: Caracarahi, Rio Branco, *Ducke* 23788 (G, P, U, US); Bôa Vista, Rio Branco, *Ducke* 1355 (NY, in part only).

C. parvifolia is readily distinguished by its very small leaflets (not exceeding 2 cm. in length) which are narrow-lanceolate. It appears to be closely related to *C. marginata* and to *C. baubiniaefolia*.

21. CYNOMETRA HOSTMANNIANA Tul. in Arch. Mus. Paris 4:180. 1844. (T.: *Hostmann* 169!).

Medium-sized tree. Branchlets wiry, smooth, glabrous, the lenticels often inconspicuous. Petioles about 0.5 cm. long, glabrous to pubescent. Leaflets equilateral to subequilateral, ovate-lanceolate, oblong-lanceolate, 6–12.5 cm. long, 2.5–8 cm. wide, tapering sharply toward apex, usually short-acuminate, the wide side cuneate or sub-rotund at base, the costa prominulous above, the secondary veins \pm 20, strict or scarcely arcuate, the lamina obviously reticulate, non-rugulose (under mag.), thick-chartaceous to coriaceous, subequilateral, glabrous. Bracts ovate-rotund to rotund, 1–1.3 mm. long, 1–1.4 mm. wide, puberulent dorsally and marginally; bracteoles absent. Racemes often umbelloid in shape, 1–4 per axil, the rachises up to 7 mm. long, puberulent, the pedicels slender, up to 1.5 cm. long, glabrous or sparingly pubescent. Sepals ovate-oblong to oblong, 2.8–4 mm. long, 1.1–1.9 mm. wide, glabrous or puberulent dorsally, puberulent at apex. Petals narrow-oblong, up to 4.5 mm. long, 0.4–1.5 mm. wide, acuminate at apex, obtuse at base; filaments up to 4 mm. long, the anthers oblong to oblong-rotund, 0.5–0.7 mm. long; ovaries oblong to oblong-rotund, about 2 mm. long, densely pubescent, the style up to 3.8 (5?) mm. long. Legumes oblong, up to 4.5 cm. long, up to 3.5 cm. wide, the surface obviously rugulose, the rugae minutely granulose, the wall of the pericarp up to 0.5 cm. thick, the sterile pods deeply wrinkled and without any locule.

FRENCH GUIANA: without specific locality, *Melinon* s. n. (A, F, NY, P, US); *Vaillant* 101 (P).

SURINAM: without specific locality, *Haller s. n.* (U); *Wüllschlaegel 1438* (B), 1656 (B); *B. W. 198* (U); *B. W. 198a* (U), *B. W. 476* (U), *B. W. 3878* (U); *Lanjouw & Lanjouw 1891* (U); *Gonggryb 457* (U); *Lindeman 308* (U); *Watamiri River, B. W. 1508* (US); *Watamiri, B. W. 1958* (U), 3861 (U); *Maroni, Sagot s. n.* (W); *Sagot 1093* (U); *Saramacca, Stabel 198a* (NY, U, Y); *Marowynne near Poeloegeodoe, Versteeg 552* (U), 576 (U); *Marowynne River, Gonggryb 5357* (U); *Coppename River, B. W. 155* (U); *Coppename, Gonggryb 2568* (MO, U); banks of *Surinam River, Mell s. n.* (NY, US); *Paramaribo, Hostmann 169* (F, NY, W).

BRITISH GUIANA: *Brandtweg, Berbice River, British Guiana Forest Dept. 6365* (U); without specific locality *Jenmann 1859* (NY, U).

BRAZIL: AMAZONAS: *Amapa, Rio Oiapoque, Froes 25771* (US); PARÁ: *Trombetas (Cachoeira Porteira e Rio Cuminá-mirim), Ducke 10911* (R).

A number of substantial characters serve to distinguish this species: the consistently equilateral leaflets, the minute bracts, the absence of bracteoles, and the often glabrous pedicels.

It is difficult to relate this species to the other New World cynometras. Its usually umbelliform racemes are suggestive of those of *C. trinitensis* and *C. retusa*.

A fragment of a leaflet from *Lanjouw & Lanjouw 1891* (U) was found to measure 8 cm. in width, indicating that the intact leaflets reach up to 20 cm. or more in length, thus presumably possessing the largest leaflets among the New World cynometras.

Despite the numerous collections of *C. hostmanniana* very few were found in fruit; the legumes when semeniferous, are deeply wrinkled on the surface and are thin-walled (the pericarp up to 0.5 mm. thick), a noteworthy fact considering that the valves are probably the largest (up to 4.5 cm.) among the New World species. The sterile fruits are very thick walled (cf. remarks in introduction, p. 317). *Amshoff* (Fl. Surinam) makes the interesting comment that the "infertile pods . . . at last splitting into 2, showing no cavity."

Common names assigned to the species include "Sakabali" (British Guiana), "Sahkaballi" (Surinam), "Malako" (Surinam), and "Makraka" (Surinam).

22. *CYNOMETRA FISSICUSPIS* (Pittier) Pittier, *Arbol y Arbust. Venez. Legum.* 1:132. 1928.

Copaifera fissicuspis Pittier, *Arbol y Arbust. Venez. Dec.* 2-3:25. 1923. (T.: *Pittier 10933!*)

Guibourtia fissicuspis (Pittier) Léonard, in *Bull. Jard. Bot. de l'Etat Bruxelles* 19 4:402. 1949.

Trees 25-30 m. high. Trunk erect with elongated crown. Twigs smooth and glabrous below, conspicuously lenticellate, the tips angular, puberulent. Petioles 0.5-2 mm. long, 0.1 cm. wide. Leaflets sessile, ovate to ovate elliptic, 2-4.5 cm. long, 0.8-2 cm. wide, the narrow side of lamina 0.4-0.8 cm. wide, the wide side 0.5-1.1 cm. wide, obtuse and emarginate, the sinus about 0.5 mm. deep, often apiculate at base of sinus, the narrow side of lamina attenuate toward base, the wide side of lamina auriculate at base, the costa prominulous above and below, the principal secondary veins 10-20, slender, prominulous, the lamina drying light green to light brown, subcoriaceous, glabrous, subequilateral to obviously inequi-



Fig. 1. *Cynometra fissicuspis*
Flower $\times 7$; flowering twig $\times 2$; fruit $\times 2$.

lateral, reticulate. Racemes 1-2 per axil, the rachises up to 2 mm. long, the flowers ± 6 per rachis. Pedicels up to 6 mm. long, about 0.3 mm. wide, puberulent. Bracts up to 2 mm. long, concave, glabrous. Bracteoles narrowly oblong, up to 2 mm. long, about 0.5 mm. wide, vaguely carinate, sparsely hairy above middle to glabrous. Sepals 4-5, oblong, up to 3 mm. long, up to 2 mm. wide, glabrous, thin. Petals lanceolate, up to 3 mm. long, 0.5-1.1 mm. wide, acute or subobtusate at apex, glabrous; filaments up to 6 mm. long, about 0.15 mm. wide, the anthers up to 0.7 mm. long; ovary rotund, up to 2 mm. long, glabrous, the style up to 3 mm. long, the stigma capitate, the ovules solitary. Legumes obliquely orbicular, 1-2 cm. in diameter, falcately apiculate, indehiscent, the valves reticulate, and papillate or rugulose (sub mag.), a slender keel (up to 0.5 mm. wide) on dorsal side, the wall of pericarp about 0.5 mm. thick, the seeds solitary, filling the locule.

VENEZUELA: ZULIA: Río Lora, Santa Ana, Pittier 10933 (GH, NY, US).

COLOMBIA: Río Zulia, Nicéforo s. n. (US); MADGALENA: Cucharo, Castañeda 641 (MO).

This is the only species among the New World cynometras which has had a complicated taxonomic history. This is due to the fact that the type collections distributed to herbaria are all sterile and secondly due to Pittier's description of the leaflets as pellucid-punctate. The leaflets are not so characterized although some show (under magnification) areas which have become thinner, probably due to drying.

The flowering and fruiting material of *Nicéforo* s. n. provided a solution to the difficulty. The flowers are obviously those of a *Cynometra*. Their glabrous condition is unique for the New World species. Perhaps more noteworthy are the coin-like (thus section Nummus) legumes, smooth and reticulate on the surface, and the leaflets auriculate on the wide side at the base. The common name of *C. fissicuspis* is "Aracito" (fide Pittier).

SPECIES TRANSFERRED OR EXCLUDED

I am transferring two species of *Cynometra*, apparently known only from Minas Geraës, Brazil, to the genus *Peltogyne*.

PELTOGYNE glazovii (Taub.) Dwyer, comb. nov.

Cynometra Glazovii Taub. Flora 75:76. 1892.

Type Locality: Minas Geraës, Brazil.

Distribution: Known only from the State of Minas Geraës, Brazil.

BRAZIL: MINAS GERAËS: sans locality, *Glaziou* 13725; *Glaziou* 14617 (NY, P, US).

PELTOGYNE riedeliana (Harms) Dwyer, comb. nov.

Cynometra riedeliana Harms, Fedde Report 24. 209. 1928.

Type Locality: Minas Geraës, Brazil.

Distribution: Known only from Brazil.

BRAZIL: without locality, *Dorsett*, *Shamel* & *Popenoe* 136b (U); MINAS GERAËS: Serro do Corcovado, *Riedel* & *Luschnath* 1182 (A, US); locality and State not decipherable, *Riedel* 601 (?) (F, photo. and frag. of syntype collection of *C. riedeliana* ?).

Two important characters make it clear that the two species are referable to *Peltogyne*: the paniculate inflorescence and the glandular-punctate nature of the sepals and leaflets. The flowers of all of the cynometras, including the many species of the Old World, are in racemes and have non-glandular sepals. Another character of importance is the pubescence of the sepals on the inner surface; in all of the New World cynometras the sepals are glabrous within, except rarely at the very base. Unfortunately the fruits of *Peltogyne riedeliana* and *P. glazovii* are unknown.

Ducke in a recent paper (1949) has contributed valuable data on the Amazonian species of *Peltogyne*. From a study of his paper, as well as from a study of specimens it appears that *P. glazovii* and *P. riedeliana* belong to the *P. pauciflora*, *P. floribunda*, and *P. discolor* complex, segregated by Ducke in his key (loc. cit.).

I have excluded the following species from the main body of the paper for reasons discussed below.

1. *CYNOMETRA ZAMORANA* R. E. Schultes, Bot. Mus. Leaflet Harvard 13(10): 301-302. 1949.

C. zamorana is referable to the genus *Hymenaea*; the type of *C. zamorana* is Schultes 5429 (GH) from Comisaria del Vaupes, Río Macaya, Cachivera del Diablo, Colombia.

2. *CYNOMETRA SPHAEROCARPA* Pittier, Enum. de Las Plantas Usuales 184. 1926.

Unfortunately I have not seen the type material (in fruit only) collected at Caruao, Federal District, Venezuela. Pittier not only fails to indicate the type collection but also mentions only a few characters which may be of importance: "las hojas inequilanceadas, largamente atenuadas . . . los frutos son subglobosos, de 3.5-4 cm. de diametro." Pittier states that the common name is "cobalonga", and adds that the wood is excellent for construction and the seeds are "estomáquicas y antipalúdicas".

BIBLIOGRAPHY FOR NEW WORLD SPECIES OF CYNOMETRA

- Amshoff, G. J. H. *Papilionaceae*. In Pulle's Flora of Surinam II. Part 2:90-93. 1939.
- Bentham, G. *Caesalpiniae*. In Mart. Fl. Bras. 15²:41-254. 1876.
- Britton, N. L. & Rose. *Caesalpiniae* (*Cynometra*). In North American Flora 23 (4):220-221. 1930.
- Ducke, A. *Notes on the Purple-Heart Trees (Peltogyne) of Brazilian Amazonia*. In Tropical Woods 54:1-7. 1938.
- Ducke, A. *Cynometra*. In Notas Sobre a Flora Neotropica II. (Legum. Amazonia Brasileira) In Bol. Técn. Inst. Agron. do Norte (Belem) 18:73-75. 1949.
- Dwyer, J. D. *The Central American, West Indian and South American Species of Copaifera (Caesalpiniae)*. In Brittonia 7 (3):143-172. 1951.
- Dwyer, J. D. *The Tropical American Genus Tachigalia Aubl. (Caesalpiniae)*. In Ann. Mo. Bot. Garden 41:223-260. 1954.
- Dwyer, J. D. *The Tropical American Genus Sclerolobium Vogel (Caesalpiniae)*. In Lloydia 20(2):67-118. 1957.
- Léonard, J. *Notulae Systematicae IV Caesalpiniae-Amberstiae Africanae Americanaeque*. In Bull. Jard. Bot. Brux. XIX (4):384-408. 1949; XX (2):270-284. 1950.
- Léonard, J. *Les Cynometra et Les Genres Voisins en Afrique Tropicale*. In Bull. Jard. Bot. Brux. XXI(3-4):373-450. 1951.
- Léonard, J. *Genera des Cynometreae et des Amherstiae Africaines*. In Mem. Sci. Acad. Royale de Belgique 30(fasc. 2):1-314. 1957.
- Macbride, J. F. *Cynometra* in Flora of Peru Vol. XIII, Part 3:1943.
- Pittier, H. F. *Arboles Arbustos del Orden de las Leguminosas* 1:131-134. 1928.
- Woodson, R. & Schery, R. et al. *Cynometra*. In Flora of Panama (Leguminosae, second part). In Ann. Mo. Bot. Gard. 5 (3):25. 1951.

INDEX TO EXSICCATAE

Italicized numbers refer to collectors' numbers, *s. n.* (*sine numero*) to unnumbered collections; parenthetical numerals refer to the numbers assigned to the species in this monograph.

- Allen, P. and D. Allen 5264 (5).
 Archer, W. A. 7906 (14a), 7943 (14a), 8087 (14a).
 Black, G. 51-13287 (18a).
 Black, G., P. Ledaux, & Stegeman 52-14-284 (18a).
 British Guiana Forest Service G126 (18a), 6217 (9a), 6365 (21).
 British Honduras Forest Dept. 5 (4).
 Britton, N. L. 1183 (6).
 Broadway, W. E. *s. n.* (6).
 Burchell, W. J. 8830 (18a), 9951 (18a).
 B. W. 155 (21), 198 (21), 198a (21), 476 (21), 6086 (9a), 658 (9a), 1137 (18a), 1257 (9a), 1508 (21), 155 (20), 1958 (21), 3861 (21), 3878 (21), 4885 (9a), 5868 (9a), 6086 (9a).
 Capucho 529 (18a).
 Cardona, F. 865 (13), 884 (9b).
 Castañeda 641 (22).
 Castleton Garden 11 (6).
 Cowles, H. T. *s. n.* (3), 347 (3), 2048 (3).
 Cuatrecasas, J. 7754 (18a).
 Delgado 216 (9a) or (14a).
 Ducke, A. 509 (14b), 676 (14b), 9083 (16), 719 (14a), 1010 (14b), 1355 (18a or 20), 1593 (15), 2320 (14a), 3549 (14a), 7165b (17), 8412 (14a), 10820 (14a), 10911 (21), 16894 (13), 16896 (18b), 16898 (9a), 20208 (13), 23788 (20), 24247 (14a), 24248 (14a), 35415 (14b).
 Eggers, H. F. 15752 (11).
 Ekman, E. L. H2343 (1), H4563 (1), 12511 (3), 12684 (2), 12978 (2), 17375 (2), 18204 (2).
 Eyerdam 310 (1).
 Ferris, R. 6188 (10), 6237 (10).
 Froes, R. L. 21043 (18a), 23600 (9a), 25771 (21).
 Froes, R. L. & Murça 24014 (9c).
 Fuertes 1452 (3).
 Goeffrey *s. n.* (11).
 Glaziov, A. 13756 (13), 18426 (18a).
 Gleason, H. A. & M. Cook A-21 (3), A-136 (3).
 Gonggryp, J. W. 457 (21), 2568 (21), 3751 (20), 5357 (21).
 Gonggryp, J. W. & G. Stahel 1010 (9b).
 Haller *s. n.* (21).
 Hayes, S. 29 (9a).
 Herb. N. Y. Gard. Record 6217 (18a).
 Hinton, G. 10893 (10).
 Hostmann, F. W. 169 (21), 204 (20).
 Hottle 23 (4).
 Im Thurn, E. F. *s. n.* (18a).
 Irwin 814 (18a).
 Jenmann, G. S. 1859 (21).
 Jiménez, J. 458 (3), 2495 (3).
 Johnson, H. 1291 (4).
 Jørgensen, J. 2124 (18c).
 Kappler, A. 1905 (20).
 Killip, E. P. 37611 (18a).
 Klug, G. 1448 (14a).
 Kuhlmann, J. 1067 (13), 2919 (18a), 17655 (14a).
 Krukoff, B. A. 6439 (12), 6631 (12), 8418 (12).
 Lanjouw, J. 858 (9a), 1219 (9a).
 Lanjouw, J. & J. Lanjouw 1891 (21).
 Lanjouw, J. & Lindemann 2964 (9a), 3471 (20).
 Langlassé, E. *s. n.* (10), 441 (10).
 León, Bro. 13552 (2), 13805 (2).
 Leonard, G. M. & E. C. Leonard 12748 (1).
 Level 89 (9a).
 Lindemann 308 (21).
 Little, E. L. 6622 (11).
 Maguire, B. 24040a (9a), 32705 (9a).
 Maguire, B. & Maguire 4047 (18a), 23856 (9a), 23906 (9a), 24040 (9a), 24040a (9a), 29010 (19).
 Matuda, E. 3796 (10).
 McStyle, J. *s. n.* (18a).
 Melinon, M. *s. n.* (21).
 Mell, *s. n.* (21), 17 (18a).
 Nelson 7004 (10).
 Newman, L. M. *s. n.* (18a).
 Nicéforo, H. *s. n.* (22).

- Paul, Bro. 463 (9a).
 Pedersen, T. 1295 (18c).
 Pires, J. M. 1327 (18a), 3912 (14a).
 Pires, J. M. & Silva 4210 (14a).
 Pittier, H. F. 216 (14a), 10933 (22).
 Purpus, C. A. 7383 (10).
 Richard, L. C. M. s. n. (13).
 Record, S. 8832 (4).
 Rodrigo 782 (18a).
 Rovirosa, J. N. 748 (4).
 Sagot, P. A. s. n. (21), 1093 (21).
 Sagra, de la R. s. n. (2), 307 (2).
 Schipp, N. A. 1192 (7).
 Schomburgk, Rich. s. n. (9b), s. n. (18a),
 197 (168) (14a), 230 or 231 (18a), 241
 (18a), 777 (9b), 1533 (9b).
 Schomburgk, Robt. (Herb Hance 7667)
 s. n. (9b).
 Schott, A. C. XII 857 (8).
 Schultes, R. & I. Cabrera 12616 (14a).
 Schwacke, C. A. W. 358 (14a).
 Schweintz s. n. (18a).
 Sintenis, P. E. E. 5600 (3).
 Sneathlage, E. H. 10408 (14a).
 Spruce, R. s. n. (14a), s. n. (14b), 872
 (14a), 1428 (14b), 1513 (14a), 3479
 (14a).
 Stahel, G. 198a (21).
 Standley, P. 7873 (4), 24254 (4), 52915
 (4), 56686 (4).
 Standley, P. & Valerio 48799 (5).
 Steyermark, J. 38671 (4), 44557 (4),
 45034 (18a), 45565 (4).
 Tessmann, G. 3444 (18a), 3636 (14a).
 Tresling, J. 300 (9a).
 Trinidad Bot. Gard. (6).
 Tonduz, A. 9972 (5).
 Ule, E. 7776 (18a), 8864 (14a).
 Vaillant 101 (21).
 Versteeg, G. M. 552 (21), 576 (21).
 Williams, Llewelyn 40 (18a), 1984 (18a),
 8142 (18a), 13037 (18a), 15593 (14a).
 Wright, C. 2386 (2).
 Wüllschlaegel, H. R. 1438 (21), 1656
 (21).
 Yunker, Koepfer, & H. Wagner 8007
 (4).



ANN.
.50

FLORA OF PANAMA

BY

ROBERT E. WOODSON, JR. AND ROBERT W. SCHERY
AND COLLABORATORS

PART VII

PASSIFLORACEAE—CORNACEAE

CONTENTS

PART VII, FLORA OF PANAMA

Ann. Missouri Bot. Gard. **45**: 1-91, 1958. (Published March 20)

- Family 131 Passifloraceae (Robert E. Woodson, Jr.) 1-22
- Family 131 Caricaceae (Robert E. Woodson, Jr.) 22-31
- Family 132 Loasaceae (Robert E. Woodson, Jr.) 32-40
- Family 133 Begoniaceae (Lyman B. Smith & Bernice G. Schubert) 41-67
- Family 134 Cactaceae (Robert E. Woodson, Jr.) 68-91

Ann. Missouri Bot. Gard. **45**: 93-201, 1958. (Published May 27)

- Family 135 Thymelaeaceae (Robert E. Woodson, Jr.) 93-97
- Family 136 Lythraceae (Lorin I. Nevling, Jr.) 97-115
- Family 137 Lecythidaceae (Robert E. Woodson, Jr.) 115-136
- Family 138 Rhizophoraceae (David P. Gregory) 136-142
- Family 139 Combretaceae (A. W. Exell) 143-164
- Family 140 Myrtaceae (G. J. H. Amshoff) 165-201

Ann. Missouri Bot. Gard. **45**: 203-304, 1958. (Published Oct. 28)

- Family 141 Melastomataceae (H. A. Gleason) 203-304

Ann. Missouri Bot. Gard. **46**: 195-256, 1959. (Published Oct. 15)

- Family 142 Onagraceae (Philip A. Munz) 195-221
- Family 143 Haloragidaceae (Robert E. Woodson, Jr.) 221-223
- Family 144 Araliaceae (Lorin I. Nevling, Jr.) 223-242
- Family 145 Umbelliferae (Mildred E. Mathias & Lincoln Constance) 242-254
- Family 146 Cornaceae (Robert E. Woodson, Jr.) 254-256

Ann. Missouri Bot. Gard. **54**: iii-xiii, 1967.

Index

INDEX

Flora of Panama, Part VII

New taxa are in **boldface** type, all other taxa are in roman type; numbers in **boldface** type in front of the colon refer to Volume number of the ANNALS and numbers in **boldface** after the colon refer to descriptions; numbers in roman type refer to synonymms; and numbers with dagger (†) refer to names incidentally mentioned.

- Acanthocereus **45: 76**; pentagonus **45: 76**
 Acca **45: 196**
 Aciotis **45: 227**; levyana **45: 227**; purpurascens **45: 228**, var. alata **45: 229†**; rostellata **45: 228**
 Acisanthera **45: 229**; limnobios **45: 231**; quadrata **45: 229**; recurva **45: 230**; uniflora **45: 230**
 Acrolasia **45: 32**; squalida **45: 34**
 Adamaram **45: 153**
 Adelobotrys **45: 205**
 Adelobotrys adscendens **45: 207**
 Adenaria **45: 112**; floribunda **45: 114**, var. α f. grisleoides **45: 114**, var. α f. purpurata **45: 114**, var. microphylla **45: 114**, var. parviflora **45: 114**; grisleoides **45: 114**; lanceolata **45: 114**; parviflora **45: 114**; purpurata **45: 114**, var. australis **45: 114**
 Aetia **45: 144**
 Aguava **45: 172**
 Ameletia **45: 98**
 Ammannella **45: 101**
 Ammannia **45: 101**; catholica **45: 100**, 102; coccinea **45: 101**, subsp. longifolia **45: 102**, subsp. robusta **45: 102**; dentifera **45: 100**; hastata **45: 102**; humilis **45: 100**, 102; latifolia **45: 102**; lingulata **45: 102**; lythrifolia **45: 102**; monoflora **45: 100**; occidentalis **45: 100**; octandra **45: 102**; pallida **45: 102**; pubiflora **45: 102**; purpurea **45: 101**; pygmea **45: 100**; ramosa **45: 100**; ramosior **45: 100**, 101, 102; robusta **45: 102**; sagittata **45: 102**; sanguinolenta **45: 102**, subsp. longifolia **45: 102**, subsp. purpurea **45: 102**, subsp. robusta **45: 102**; stylosa **45: 102**; texana **45: 102**
 Anacardium occidentale **45: 176†**
 Anamomis **45: 180**
 Anamomis fragrans **45: 182**
 Anethum **46: 246**; graveolens **46: 246**
 Anogra amplexicaulis **46: 214**
 Anstrutheria **45: 140**
 Anthactinia **45: 1**
 Antherylium **45: 114**; floribundum **45: 114**; grisleoides **45: 114**; purpuratum **45: 114**
 Apium **46: 246**; ammi **46: 247**, var. leptophyllum **46: 247**; leptophyllum **46: 247**
 Aralia arborea **46: 229**; capitata **46: 240**; fruticosa **46: 230**; ghiesbreghtii **46: 238**; longifolia **46: 239**; micans **46: 226**; mexicana **46: 238**; ovata **46: 240**; thibautii **46: 238**; tuxtensis **46: 230**; xalapensis **46: 238**
 Araliaceae **46: 223**
 Arctocrania **46: 256**
 Aristotelia **45: 153**
 Arracacia **46: 245**; atropurpurea **46: 245**; humilis **46: 245**; irazuensis **46: 245**; luxana **46: 245**
 Arthrostema **45: 220**; alatum **45: 222**; campanulare **45: 222**; macrodesmum **45: 222**
 Asophora **45: 137**
 Astephananthes **45: 1**
 Astrophea **45: 1**
 Augustia **45: 41**
 Aulacocarpus completens **45: 304**
 Aulomyrcia **45: 166†, 170**; coumeta **45: 173**; tomentosa **45: 172**; zetekiana **45: 170**
 Axinaea costaricensis **45: 209**
 Badamia **45: 153**
 Baldwinia **45: 1**; peltata **45: 12**
 Balsamona **45: 104**; pinto **45: 109**
 Bartonina **45: 32**
 Barya **45: 41**
 Begonia **45: 41**; allenii **45: 62**; barbana **45: 49**; brevicyma **45: 53, 54†**; broussonetiifolia **45: 60**; carletonii **45: 48**; carpinifolia **45: 66**; caudilimba **45: 45**; chepoensis **45: 56**; chiriquensis **45: 61**; chiriquina **45: 66**; ciliibracteola **45: 57**; coccinea **45: 61**; columnaris **45: 61**, var. glabra **45: 61**; conchifolia **45: 43**;

INDEX, FLORA OF PANAMA, PART VII

- convallariodora* **45: 67**; *cucullata* **45: 61**;
cuspidata **45: 60**; *daedalia* **45: 49**;
davidsoniae **45: 53**; *derycxiana* **45: 45**;
elliptica **45: 54**; *estrellensis* **45: 64**;
filipes **45: 56**; *fischeri* var. *tovarensis* **45: 57**; *flexuosa* **45: 56**; *garagarana* **45: 46**;
glabra **45: 54, 61**; *glandulosa* **45: 46**;
guaduensis **45: 64**; *guyanensis* **45: 56**,
var. *glaberrima* **45: 56**; *heterodonta* **45: 56**;
heydei **45: 62**; *hygrophila* **45: 56**,
var. *puberula* **45: 56**; *involucrata* **45: 60**;
laciniosa **45: 60**; *laurina* **45: 64**;
leptopoda **45: 56**; *locellata* **45: 54**; *lucida*
45: 54; *luxii* **45: 58**; *mameiana* **45: 56**;
monticola **45: 61**; *moritziana* **45: 54, 57**;
mucronistipula **45: 53, 54†**; *multi-*
nervia **45: 60**; *nelumbifolia* **45: 44**;
oaxacana **45: 58**, *β pilosula* **45: 58**;
opuliflora **45: 63**; *ottonis* **45: 64**;
physalifolia **45: 54**; *plebeja* **45: 46**;
pittieri **45: 62**; *populifolia* **45: 57**;
pubipedicella **45: 58**; *pumilio* **45: 43**;
quaternata **45: 47, 48†**; *scandens* **45: 54**;
scutellata **45: 43**; *seemanniana* **45: 66**;
semiovata **45: 56**; *serratifolia* **45: 64**;
serrulatoala **45: 58**; *spruceana* **45: 56**;
squarrosa **45: 50**; *stigmosa* **45: 48†, 50**;
strigillosa **45: 49**; *tonduzii* **45: 62**;
torresii **45: 61**; *tovarensis* **45: 57**, *β*
ocanensis **45: 57**; *trachyptera* **45: 61**;
triloba **45: 62**; *udisilvestris* **45: 58**;
urticae **45: 61**; *urticifolia* **45: 61**; *uvana*
46: 46; *vestita* **45: 51**; *villipetiola* **45: 49**;
walpersii **45: 64**
Begoniaceae **45: 41**
Begoniella **45: 42**
Bellucia **45: 258**; *costaricensis* **45: 258**
Benthamia **46: 254**; *disciflora* **46: 256**
Benthamidia **46: 254**
Bergena **45: 127**
Bergenia **45: 104**
Bertholletia excelsa **45: 116†**
Bertholonia hirsuta **45: 239**
Blakea **45: 239**; *brunnea* **45: 242**;
calycosa **45: 241**; *crinita* **45: 241**;
foliacea **45: 242**; *gracilis* **45: 242**;
parvifolia **45: 243**; *pauciflora* **45: 243**;
woodsonii **45: 241**
Blephistelma **45: 1**
Bombax quinatum **45: 80†**
Botryodendrum capitatum **46: 240**
Boykinia **45: 98**; *humilis* **45: 100**
Buceras **45: 157**; *bucida* **45: 157**
Buchenavia **45: 159**; *capitata* **45: 159**
Bucida buceras **45: 157**; *capitata* **45: 159**;
spinosa **45: 159**
Bureava **45: 115**
Cacoucia **45: 144**; *coccinea* **45: 150**
Cactaceae **45: 68**
Cactus bleo **45: 72**; *cochenillifer* **45: 74**;
elator **45: 75**; *lucidus* **45: 70**; *nigricans*
45: 75; *pendulis* **45: 91**; *pentagonus*
45: 76; *pereskia* **45: 70**; *phyllanthus*
45: 83; *pitajaya* **45: 76**; *tuna β elator*
45: 75, *γ nigricans* **45: 75**
Calophylloides **45: 179**
Calophysa setosa **45: 254**; *tococoidea* **45: 254**
Calycampe **45: 172**
Calycolpus **45: 166†, 177†, 192**; *parviflorus*
45: 196; *warszewiczianus* **45: 194**
Calyptectus **45: 110**
Calypthranthes **45: 166**
Calypthranthes **45: 166**; *aromatica* **45: 167†**;
chytraculia **45: 169**; *costaricensis*
45: 169; *hylobates* **45: 169**; *mill-*
spaughii **45: 169†**; *pittieri* **45: 167†**;
schiedeana **45: 167**; *schlechtendaliana*
45: 167; *tonduzii* **45: 198**; *tumidonodia*
45: 167; *urophylla* **45: 167**
Calypthranthus **45: 166**
Calyptrella **45: 212**; *micrantha* **45: 214**
Calyptropsidium **45: 196**; *friedrichsthali-*
anum **45: 200**; *sartorianum* **45: 198**
Campylochiton **45: 145**
Carica **45: 26**; *chiriquensis* **45: 30, 31†**;
curcubitifolia **45: 29, 30†**; *dolichaula*
45: 23; *hermaphrodita* **45: 26**; *mamaja*
45: 26; *papaya* **45: 26, 28†, 30†**
Caricaceae **45: 22, 23†**
Carpophyllus **45: 69**
Casparya **45: 41**; *coccinea* **45: 61**; *colum-*
naris **45: 61**, *β glabra* **45: 61**; *trachyp-*
tera **45: 61**; *urticae* **45: 61**, *β hispida*
45: 61
Cassipourea **45: 136†, 140**; *alba* **45: 142**;
cubensis **45: 142**; *elliptica* **45: 142**,
β alba **45: 142**, *γ pauciserrata* **45: 142**;
macrodonia **45: 142**; *podantha* **45: 142**
Cassutha **45: 91†**
Catappa **45: 153**
Catinga **45: 179**
Centradenia **45: 218**; *inaequilateralis* **45: 219**;
maxoniana **45: 220**
Centronia **45: 212**; *grandiflora* **45: 212**;
tomentosa **45: 212**
Ceratospepalum **45: 1**; *micranthum* **45: 15**
Cereus **45: 68†**; *acutangulus* **45: 76**, sub-
sect. *Acanthocereus* **45: 76**, subgen. *Hylo-*
cereus **45: 78**; *costaricensis* **45: 80**; *dussii*

INDEX, FLORA OF PANAMA, PART VII

- 45: 76; monacanthus 45: 80; nitidus 45: 76; pentagonus 45: 76; phyllanthus 45: 83; pitajaya 45: 76; polyrhizus 45: 80; princeps 45: 76; prismaticus 45: 76; sirul 45: 76; trigonus var. costaricensis 45: 80; variabilis 45: 76; vasmeri 45: 76
- Cerocarpus 45: 179
- Chaetolepis nana 45: 234
- Chamaepericlymenum 46: 254
- Chichharronia 45: 153
- Chloromyrtus 45: 180
- Chrysostachys 45: 145; ovatifolia 45: 151
- Chrysostoma 45: 32
- Chuncoa 45: 153; amazonia 45: 155; obovata 45: 155
- Chytraculia 45: 166
- Chytralia 45: 166
- Ciclospermum 46: 246
- Cieca 45: 1; angustifolia 45: 13; auriculata 45: 11; appendiculata 45: 11; cinerea 45: 11; coriacea 45: 10; difformis 45: 10; discolor 45: 9; flexuosa 45: 13; glabrata 45: 7; globosa 45: 13; hederacea 45: 13; heterophylla 45: 12; limbata 45: 13; litoralis 45: 13; membranacea 45: 14; minima 45: 12, 13; misera 45: 9; nigra 45: 12; olivaeformis 45: 13; pallida 45: 13; pannosa 45: 5; peltata 45: 13; pseudo-suberosa 45: 13; suberosa 45: 12; viridis 45: 12; warei 45: 13
- Cladomischus 45: 41
- Clidemia 45: 247; barbinervis 45: 289; capitellata 45: 252; collina 45: 253; densiflora 45: 255; dentata 45: 250; dependens 45: 252; deppeana 45: 253; dichotoma 45: 266; epiphytica 45: 255; gracilis 45: 248; hirta 45: 251; melanodesma 45: 266; melanotricha 45: 301; myrmecina 45: 254; neglecta 45: 252; novemnervia 45: 251; oblonga 45: 250; ombrophila 45: 256; pittieri 45: 250; purpureo-violacea 45: 256; reflexa 45: 254; reitziana 45: 253; rubra 45: 255; setosa 45: 254; spectabilis 45: 254; strigillosa 45: 251; subseriata 45: 266; taurina 45: 254; toccoidea 45: 254
- Clidemiastrum mexicanum 45: 265
- Coleophora 45: 94
- Combretaceae 45: 143, 144
- Combretum 45: 143†, 144; sect. Cacoucia 45: 145, 150†; sect. Combretastrum 45: 145; sect. Eucombretum 45: 145; sect. Spinosa 45: 145; accedens 45: 151; adenophyllum 45: 151; alternifolium 45: 152; aurantiacum 45: 147; benthamianum 45: 147; brunnescens 45: 151; bugi 45: 151; cacoucia 45: 143†, 145†, 150; coccineum 45: 150; cordatum 45: 150; decandrum 45: 145†, 152, 153†; epiphyticum 45: 151; eriopetalum 45: 152; farinosum 45: 147, 149†; ferrugineum 45: 150, 151; formosum 45: 147; fruticosum 45: 147, 145†, 149†; gloriosum 45: 147; guayca 45: 152; jacquinii 45: 151; latepaniculatum 45: 152; laxum 45: 145†, 147, 150; lepidopetalum 45: 147; loeflingii 45: 147, subsp. ornithophilum 45: 147; marchii 45: 151; mexicanum 45: 150, 151†; micropetalum 45: 147; multidiscum 45: 147; nicoyanum 45: 152; oblongifolium 45: 151; obtusifolium 45: 150; occidentale 45: 147; odoratissimum 45: 151; odoratum 45: 150; palmeri 45: 152; phaenopetalum 45: 147; puberum 45: 150; pulchellum 45: 151; punctulatum 45: 152; sam-buense 45: 145†, 149; secundum 45: 147; spinosum 45: 145†, 152; superbum 45: 147; terminalioides 45: 151; variabile 45: 151; viscidum 45: 151; warszewiczianum 45: 147
- Conocarpus 45: 143†, 161; acutifolius 45: 161; erectus 45: 161, var. arboreus 45: 161, var. erectus 45: 161†, procumbens 45: 161, var. sericeus 45: 161†; procumbens 45: 161; pubescens 45: 161; racemosus 45: 162; supinus 45: 161
- Conostegia 45: 269, 279†; bracteata 45: 271; chiriquensis 45: 275; excelsa 45: 209; hirsuta 45: 270; lanceolata 45: 271; macrantha 45: 270; micrantha 45: 275; micromeris 45: 273; montana 45: 274; oerstediana 45: 270; polyandra 45: 273; puberula 45: 273; setosa 45: 270; sororia 45: 273; speciosa 45: 271; subcrustulata 45: 274; xalapensis 45: 271
- Consolea 45: 75
- Cornaceae 46: 254
- Cornelia 45: 101
- Cornella 46: 254
- Cornus 46: 254; capitata 46: 256; disciflora 46: 256, var. floccosa 46: 256, f. floccosa 46: 256; floccosa 46: 256; florida 46: 256†
- Corynostigma 46: 195
- Couratari 45: 116†, 134; panamensis 45: 134
- Couroupita 45: 125; cutteri 45: 127†; darienensis 45: 127†; guianensis 45: 125†; nicaraguensis 45: 127†; odoratissima 45: 127†; parviflora 45: 127†, 134†

INDEX, FLORA OF PANAMA, PART VII

- Creolobus* **45: 32**
Cristaria **45: 144**
Cryptotheca **45: 101**
Cubospermum **46: 195**
Cuphea **45: 104**; *antisiphilitica* **45: 108**;
appendiculata **45: 110**; *balsomona* **45: 109**;
calophylla **45: 105†, 108**, var. *calophylla* **45: 108**, f. *breuningii* **45: 108**,
f. *deformis* **45: 108**, f. *plumbaginea* **45: 108**,
var. *microstyla* **45: 108**, var. *orthodisca* **45: 108**;
carthagenensis **45: 109**; *elliptica* var. *alba* **45: 109**;
epilobifolia **45: 107**, var. *caquetæ* **45: 107**, var. *costaricensis* **45: 107**, f. *canescens* **45: 107**,
f. *endresii* **45: 107**, f. *hoffmannii* **45: 107**, f. *tonduzii* **45: 107**, var. *venezuelana* **45: 107**,
f. *gollmeri* **45: 107**, f. *lindenii* **45: 107**;
gracilis **45: 105**; *infundibulum* **45: 110**, var. *foliosa* **45: 110**;
microstyla **45: 108**; *orthodisca* **45: 108**; *panamensis* **45: 105**;
plumbaginea **45: 108**; *rigidula* **45: 105**;
rotundifolia **45: 105†**; *setosa* **45: 105**, var. *α* f. *seemannii* **45: 105**, var. *glabrescens* **45: 105**;
utriculosa **45: 105**, var. *α* f. *ciliifolia* **45: 105**, f. *communis* **45: 105**, var. *donnell-smithii* **45: 105**, var. *panamensis* **45: 105**
Cyathocnemis **45: 41**
Cylospermum leptophyllum **46: 247**
Cylicomporpha **45: 23†**
Cynoxylon **46: 254**
Dactylopetalum **45: 140**
Daphnopsis **45: 94**; *seibertii* **45: 93†, 95**
Davya macrophylla **45: 209**
Decaloba **45: 1**; *biflora* **45: 7**, var. *major* **45: 7**, var. *mexicana* **45: 7**; *cyathophora* **45: 11**; *holosericea* **45: 11**; *jacquini* **45: 14**; *punctata* **45: 9**; *rohrii* **45: 11**; *sexflora* **45: 5**
Dendropanax **46: 228**; *alare* **46: 230**;
alberti-smithii **46: 232**; *arboreus* **46: 229**;
brachypodum **46: 230**; *darienensis* **46: 234**;
gonatopodus **46: 231**; *insulare* **46: 230**;
juergenseni **46: 230**; *langeanum* **46: 230**;
matudai **46: 230**; *monticola* **46: 230**;
praestans **46: 232**; *querceti* **46: 234**;
samydifolium **46: 230**; *sessiliflorus* **46: 231**; *stenodontus* **46: 231**
Didymopanax **46: 226**; *micans* **46: 226**;
morototoni **46: 226**; *pittieri* **46: 228**
Diploclinium **45: 41**
Diolena **45: 236**; *spicata* **45: 236**
Depetalon **45: 104**
Diplostemon **45: 101**
Dirca palustris **45: 93†**
Disemma **45: 1**; *hahnii* **45: 9**
Distemma **45: 1**
Distephana **45: 1**
Distephania **45: 1**
Distephia **45: 1**
Dithea **45: 101**
Donaldia **45: 41**; *ottonis* **45: 64**
Doratometra **45: 41**
Dysemone **46: 221**
Dysosmia **45: 1**; *acerifolia* **45: 15**; *ciliata* **45: 21**;
foetida **45: 21**; *fluminensis* **45: 21**;
gossypifolia **45: 21**; *hastata* **45: 21**;
hibiscifolia **45: 21**; *nigelliflora* **45: 21**
Elsholtzia **45: 125**
Embryogonia **45: 145**
Encliandra **46: 218**
Endecaria **45: 104**
Epiphyllum **45: 82**; *costaricense* **45: 86**;
gaillardae **45: 83**; *gigas* **45: 87**;
lepidocarpum **45: 85**; *macropterum* **45: 86**,
87†; *oxypetalum* **45: 87†**; *phyllanthus* **45: 83**;
pittieri **45: 85**; *thomasianum* **45: 86**
Epleiendia **45: 179**
Erndelia **45: 1**
Eryngium **46: 248**, 250†; *affine* **46: 250**;
carlinae **46: 250**; *foetidum* **46: 250**
Eschweilera **45: 116†, 130**; *calyculata* **45: 130†**;
133; *garagarae* **45: 133**; *panamensis* **45: 130**, 131†;
pittieri **45: 131**; *reversa* **45: 130**, 131†;
verruculosa **45: 131**
Eucalyptus **45: 166†**; *globulus* **45: 166†**
Eugenia **45: 166†, 179**; *acapulcensis* **45: 181†**,
189; *alfaroana* **45: 181**; *antiquae* **45: 189**;
arayan **45: 184†**; *austin-smithii* **45: 191**;
axillaris **45: 189†**; *balancensis* **45: 187**;
banghamii **45: 186**; *biflora* **45: 181†**,
184; *cartagenensis* **45: 189**; *chepensis* **45: 181†**,
185; *chrysophyllum* **45: 191**;
colipensis **45: 189**; *coloradensis* **45: 181†**,
186; *costaricensis* **45: 186**; *coumeta* **45: 173**;
cricamolensis **45: 191**; *floribunda* **45: 177**;
fragrans **45: 181†**, **182**; *hiraeifolia* **45: 189**, 190†;
jambos **45: 176**; *javanica* **45: 177**;
malaccensis **45: 176**; *maritima* **45: 189**;
melanosticta **45: 186**; *micellii* **45: 182**;
nesiotica **45: 181†**, **184**; *ochra* **45: 190**;
octopleura **45: 191**; *oerstedea* **45: 181†**,
187; *o'neillii* **45: 177**; *oreinoma* **45: 192**;
origanoides **45: 181†**, **186**; *pittieri* **45: 185**;
rigidissima **45: 184†**; *roraimana* **45: 190**;
salamancana **45: 190**; *sericiflora* **45: 184**;
sp. **45: 187**; *storkii* **45: 182**; *tapacumensis* **45: 190**;
tomentosa **45: 172**; *uniflora* **45: 182**;

INDEX, FLORA OF PANAMA, PART VII

- vallis **45**: 172; vismeaefolia **45**: 179;
warszewiczii **45**: 194; zetekiana **45**: 170
- Eukrania **46**: 254
- Eupetalum **45**: 41
- Ewaldia **45**: 41
- Falkea **45**: 41
- Fatraea **45**: 153
- Ficindica **45**: 75
- Forsgardia **45**: 144; laevis **45**: 150
- Fuchsia **46**: **218**; arborea **46**: 219; arbo-
rescens **46**: **218**, var. megalantha **46**:
219, f. parva **46**: 219, f. tenuis **46**: 219;
boliviana var. luxurians **46**: **218**; cuspi-
data **46**: 218; hamelioides **46**: 219;
hemsleyana **46**: **219**; liebmanni **46**:
219; paniculata **46**: 219; pulchella **46**:
219; syringaeiflora **46**: 219
- Gaertdia **45**: 41
- Gaura epilobia **46**: 214; fruticosa **45**: 147
- Gilibertia **46**: 229; subg. Melopanax **46**:
229; alaris **46**: 230; arborea **46**: 230;
brachypoda **46**: 230; concinna **46**: 230;
darienensis **46**: 234; eurycarpa **46**: 230;
gonatopoda **46**: 231; insularis **46**: 230;
juergenseni **46**: 230; langeana **46**: 230;
matudai **46**: 230; praestans **46**: 232;
querceti **46**: 234; rothschuhii **46**: 230;
samydifolia **46**: 230; sessiliflora **46**: 231;
smithiana **46**: 230; stenocarpa **46**: 230;
stenodonta **46**: 231
- Gimbernatea **45**: 153; obovata **45**: 155
- Ginannia **46**: 229
- Gireoudia **45**: 41; conchifolia **45**: 43;
nelumbiifolia **45**: 45; stigmosa **45**: 50;
strigillosa **45**: 49; warszewicziana **45**:
43
- Godetia heucki **46**: 214
- Gonocarpus **45**: 144; jacquinii **45**: 152
- Granadilla **45**: 1; foetida **45**: 21; quad-
rangularis **45**: 18; suberosa **45**: 12
- Greggia **45**: 179
- Grias **45**: **122**; fendleri **45**: **124**; pittieri
45: **124**
- Grislea **45**: 144
- Gronovia **45**: 32†, **40**; scandens **45**: **40**
- Guajava mollis **45**: 201
- Guapurium **45**: 179
- Guiaua **45**: 196
- Gunnera **46**: **221**; insignis **46**: **223**
- Gunneria wendlandii **46**: 223
- Gunneropsis **46**: 221
- Gurltia **45**: 41
- Gustavia **45**: **117**, **118**†; brachycarpa **45**:
118†, **119**; fustis-mortui **45**: **122**†; hex-
apetala **45**: **118**†; insignis **45**: **120**; la-
ciniosa **45**: **118**†; nana **45**: **120**; pleuro-
carpa **45**: **118**; rhodantha **45**: **120**;
superba **45**: **120**, var. salviniae **45**: **120**
- Haagea **45**: 41
- Haloragidaceae **46**: **221**
- Hambergera **45**: 144
- Hambergia **45**: 144
- Happalocarpum **45**: 101
- Hargasseria **45**: 94
- Hariota **45**: 89; cassytha **45**: 91
- Hartmannia **46**: 212; affinis **46**: 214;
cuprea **46**: 213; epilobiifolia **46**: 213;
gauroides **46**: 214; latiflora **46**: 213;
macrantha **46**: 213; rosea **46**: 214, var.
parviflora **46**: 214; tarquensis **46**: 213;
tetraptera **46**: 213; virgata **46**: 214
- Hedera alaris **46**: 229; arborea **46**: 229;
capitata **46**: 240; frondosa **46**: 240; xala-
pensis **46**: 238
- Heeria **45**: 223; cupheoides **45**: 225
- Helosciadium ammi **46**: 247; leptophyllum
46: 247
- Henriettea **45**: **256**; brunnescens **45**: 260;
succosa **45**: **258**
- Henriettea **45**: **260**; densiflora **45**: 255;
fascicularis **45**: **262**; seemannii **45**:
262; tuberculosa **45**: **262**
- Hesperaster **45**: 32
- Heterocentron **45**: **223**; glandulosum **45**:
224
- Heterotrichum **45**: **277**, 279†; novem-
nervium **45**: 251; octonum **45**: **277**
- Hexachlamys **45**: 179
- Hoffmannella rosea **45**: 56
- Horau **45**: 162
- Hudsonia **45**: 159; arborea **45**: 159
- Huidobria **45**: 36
- Huszia **45**: 41
- Hydrocotyle **46**: **251**, 252†; batrachioides
46: 253; bonariensis **46**: **254**; brevipes
46: 253; costaricensis **46**: 253; fluitans
46: 253; mexicana **46**: **253**; multiflora
46: 254; natans **46**: 253; petiolaris **46**:
253; polystachya **46**: 253; pusilla **46**:
253; ranunculoides **46**: **253**; scaposa
46: 253; spananthe **46**: 251; umbellata
46: **253**; umbellulata **46**: **253**; yuca-
tanensis **46**: 254
- Hydrolythrum **45**: 98
- Hylocereus **45**: **78**; costaricensis **45**: 80,
81†; monocanthus **45**: **80**; polyrhizus
45: 78†, **80**, 81†; triangularis **45**: 78†
- Hypobrichia **45**: 98; spruciana var. tenui-
folia **45**: 100

INDEX, FLORA OF PANAMA, PART VII

- Irma* **45**: 41
Isnardia **46**: 210; *ascendens* **46**: 211; *nitida* **46**: 211; *palustris* β *americana* **46**: 210; *subhastata* **45**: 102
Isopteryx **45**: 41
Jacaratia **45**: **23**; *costaricensis* **45**: **25**; *dolichaula* **45**: **23**; *spinosa* **45**: 25†
Jambosa **45**: 175; *domestica* **45**: 176; *malaccensis* **45**: 176; *samaragnensis* **45**: 177; *vulgaris* **45**: 176
Japandiba **45**: 117; *superba* **45**: 120
Jossinia **45**: 179
Jussiaea **46**: **195**; *acuminata* **46**: 198, var. *latifolia* **46**: 198, var. *longifolia* **46**: 198; *affinis* **46**: **207**, var. *dodecandra* **46**: **208**; *alata* **46**: 199; *aluligera* **46**: 207; *angustifolia* **46**: 205; *bertonii* **46**: 199; *californica* **46**: 209; *calycina* **46**: 204; *clavata* **46**: 204; *declinata* **46**: 198; *decurrens* **46**: **199**; *dodecandra* **46**: 208; *erecta* **46**: 198, var. *plumeriana* **46**: 198, var. *sebana* **46**: 198; *ferruginea* **46**: 207; *fluitans* **46**: 209; *foliobracteolata* **46**: **203**; *frutescens* **46**: 205; *geminiflora* **46**: 200; *grandiflora* **46**: 203; *grandiflora* **46**: 208, f. *natans* **46**: 208, f. *semimera* **46**: 208, f. *terrestris* **46**: 208; *gomezii* **46**: 209; *haenkeana* **46**: 204; *helminthorrhiza* **46**: 208; *hexamera* **46**: 207; *hirsuta* **46**: 203, 204, *hirta* **46**: 203; *inclinata* **46**: **198**, var. *amazonica* **46**: 198; *inflata* **46**: 198; *latifolia* **46**: **200**; *leptocarpa* **46**: **206**, var. *meyeriana* **46**: **207**; *ligustrifolia* **46**: 205; *linifolia* **46**: **205**; *lithospermifolia* **46**: **202**; *macrocarpa* **46**: **203**; *may-purensis* **46**: 200; *michauxiana* **46**: 208; *micrantha* **46**: 205; *micropetala* **46**: 207; *mollis* **46**: 203; *natans* **46**: **208**, var. *emersa* **46**: 208; *nervosa* **46**: **200**, var. *glaberrima* **46**: 200; *occidentalis* **46**: 204; *octofila* **46**: 204; *octonervia* **46**: 205; *octovalvis* **46**: 205; *onagra* **46**: 198; *palmitensis* **46**: 200; *palustris* **46**: 199; *parviflora* **46**: 205†; *patibicensis* **46**: 209; *peploides* **46**: 209; *pescariaefolia* f. *major* **46**: 205; *peruviana* **46**: **203**, var. *australis* **46**: 203, f. *hirsuta* **46**: 203, f. *tomentosa* **46**: 203, var. *macrocarpa* **46**: 203, var. *octofila* **46**: 204; *pilosa* **46**: 206, var. *glabra* **46**: 206, var. *pterocarpa* **46**: 206, var. *robustior* **46**: 206; *plumeriana* **46**: 198; *polygonifolia* **46**: 209; *polygonoides* **46**: 209; *pterophora* **46**: 199; *pubescens* **46**: 204; *ramosa* **46**: 198; *ramulosa* **46**: 209; *repens* **46**: 209, var. *californica* **46**: 209, var. *inflata* **46**: 198, var. *grandiflora* **46**: 208, var. *hispidula* **46**: 208, var. *minor* **46**: 209, var. *peploides* **46**: 209, var. *ramulosa* **46**: 209; *rigida* **46**: 200; *sagittata* **45**: 102; *sagreaana* **46**: 205; *salicifolia* **46**: 205†; *schottii* **46**: 206; *sedifolia* **46**: **197**; *sprengeri* **46**: 203; *stenophylla* **46**: 208; *stuckerti* **46**: 208; *suffruticosa* var. *angustifolia* **46**: 205, var. *ligustrifolia* **46**: **205**, var. *liniarifolia* **46**: 205†, var. *octofila* **46**: **204**, var. *octonervia* **46**: 205, var. *sintenisii* **46**: 205; *surinamensis* **46**: 206; *swartziana* **46**: 209; *tenuifolia* **46**: 199; *uruguayensis* **46**: **208**; *variabilis* **46**: 207, var. *affinis* **46**: 207, var. *pilosa* **46**: 206; *venosa* **46**: 204; *weddellii* **46**: 205; *yacumensis* **46**: 202
Jussiaea **46**: 195
Kissenia **45**: 32†
Klaprothia **45**: 32†, 34; *mentzeloides* **45**: **35**
Knesebeckia **45**: 41
Kniphofia **45**: 153
Lafoensia **45**: **110**; *punicifolia* **45**: **112**
Lagerstroemia **45**: 98†; *indica* **45**: 98†; *speciosa* **45**: 98†
Laguncularia **45**: **162**; *glabriflora* **45**: 164†; *obovata* **45**: 162; *racemosa* **45**: **162**, 164†
Lasiandra bipenicellata **45**: 234
Lauchea **45**: 41
Lawsonia **45**: 98†; *inermis* **45**: 98†
Leandra **45**: **265**; *consimilis* **45**: **268**; *dichotoma* **45**: **266**; *melanodesma* **45**: **266**; *mexicana* **45**: **265**
Leandra strigosa **45**: **268**; *subulata* **45**: **268**; *subseriata* **45**: **266**
Lecythidaceae **45**: **115**, 116†
Lecythis **45**: 116†, **127**, 130†; *ampla* **45**: **128**, 130†; *armilensis* **45**: 128, 130†; *coriacea* **45**: 120†; *costaricensis* **45**: 128†; *melliana* **45**: 128; *tuyrana* **45**: **128**
Lecythopsis **45**: 134
Legnotis **45**: 140; *elliptica* **45**: 142
Lepsia **45**: 41
Loasa **45**: **36**; *bipinnata* **45**: 36; *grandis* **45**: **38**; *papaverifolia* **45**: 38†; *rhoeadiifolia* **45**: 36; *rudis* **45**: **36**, 38†; *speciosa* **45**: **38**; *triphylla* var. δ *rudis* **45**: 36, 38†
Loasaceae **45**: **32**
Lomastelma **45**: 179
Lopezia **46**: **216**; *paniculata* **46**: **216**
Loreya **45**: **260**; *brunnescens* **45**: **260**
Ludwigia **46**: **210**; *acuminata* **46**: 198; *affinis* **46**: 207; *angustifolia* **46**: 205; *apetala* **46**: 210; *ascendens* var. *peploides*

INDEX, FLORA OF PANAMA, PART VII

- 46: 209; clavellina var. grandiflora 46: 208; decurrens 46: 199; erecta 46: 198; foliobraceolata 46: 203; helminthorrhiza 46: 208; hirta 46: 203; jussiaeoides 46: 199; latifolia 46: 200; leptocarpa 46: 206; lithospermifolia 46: 202; micrantha 46: 205; nervosa 46: 200; nitida 46: 211; palustris var. inundata 46: 211, var. nana 46: 210; peruviana 46: 203; pubescens 46: 204, var. ligustrifolia 46: 205; repens 46: 210; sagreana 46: 205; scabriuscula 45: 102; seditoides 46: 197; uniflora 46: 199; urugayensis 46: 208; verticellata 46: 212
- Lythraceae 45: 97
- Lythrum carthagenensis 45: 109
- Macrocarpium 46: 254
- Macrophora 45: 1; sanguinea 45: 15
- Magnusia 45: 41
- Maieta setosa 45: 254; tococoidea 45: 254
- Maja 45: 104
- Malidra 45: 179
- Mangium 45: 137
- Mangle 45: 137
- Meioperis 45: 1; angustifolia 45: 13; hederacea 45: 13; minima 45: 13; pallida 45: 13; pannosa 45: 5; peltata 45: 13; suberosa 45: 13
- Melaleuca 45: 166†; leucodendron 45: 166†
- Melanium 45: 104; adscendens 45: 207; albicans 45: 292; aquaticum 45: 227; argentea 45: 287
- Melastoma capitellata 45: 252; caudata 45: 283; ciliata 45: 296; diversifolia 45: 264; fascicularis 45: 262; hirtum 45: 251; holosericea 45: 282; ibaguense 45: 289; lacera 45: 297; micrantha 45: 264; montana 45: 274; mucronata 45: 282; nervosum 45: 292; octonum 45: 277; prasina 45: 290; purpurascens 45: 228; rubens 45: 301; rubiginosa 45: 293; rubra 45: 255; strigillosa 45: 251; sucrosa 45: 258; theaezans 45: 299; xalapense 45: 271
- Melastomataceae 45: 203
- Melfona 45: 104
- Melvilla 45: 104
- Mentzelia 45: 32; aspera 45: 34; pedicellata 45: 34; stipitata 45: 34
- Meriania 45: 207; macrophylla 45: 209; panamensis 45: 207
- Mesomora 46: 256
- Mezierea 45: 41
- Miconia 45: 279, 296†; sect. Adenodesma 45: 284; sect. Amblyarrhena 45: 296†, 297; sect. Chaenopleura 45: 301; sect. Cremanium 45: 299, 301†; sect. Glosso-centrum 45: 294; sect. Hartigia 45: 296; sect. Jucunda 45: 282; sect. Miconia 45: 284, 296†; sect. Tamonea 45: 283, 296†; aeruginosa 45: 286; albicans 45: 292; amplexans 45: 284; angustispica 45: 286; argentea 45: 287; atosanguinea 45: 301; barbinervis 45: 289; blakeaeifolia 45: 296†; borealis 45: 294; calvescens 45: 289; curvipetiolata 45: 296†; caudata 45: 283; ciliata 45: 296; costaricensis 45: 298; cuspidatis-sima 45: 300; darienensis 45: 290; disparilis 45: 282; gatunensis 45: 283; gonistigma 45: 298; gracilis 45: 286; holosericea 45: 282; hondurensis 45: 283, 296†; hyperprasina 45: 291; ibaguensis 45: 289; impetiolaris 45: 288, var. impetiolaris 45: 288, var. pandurifolia 45: 288; insularis 45: 291; lacera 45: 297; lateriflora 45: 282; melanotricha 45: 301, var. melanotricha 45: 302, var. panamensis 45: 302; mucronata 45: 282; nervosa 45: 292; oinochrophylla 45: 296; panamen-sis 45: 293; pittieri 45: 300; prasina 45: 290; pteropoda 45: 290; robinson-iana 45: 296†; rubens 45: 301; rubigi-nosa 45: 293; rufostellulata 45: 294; septuplinervia 45: 292; shattuckii 45: 279†, 302; schlimii 45: 298; steno-stachya 45: 287; subcrustulata 45: 274; theaezans 45: 299; transversa 45: 296†; triplinervis 45: 286
- Microjambosa 45: 175
- Milligania 46: 221
- Misandra 46: 221
- Misandropsis 46: 221
- Mitrantes sartorianum 45: 198
- Mitropsidium sartorianum 45: 198
- Mitscherlichia 45: 41
- Monactineirma 45: 1; angustifolia 45: 12; coriacea 45: 10; hederacea 45: 12; minima 45: 12; peltata 45: 12; suberosa 45: 12
- Monochaetum 45: 214; bracteolatum 45: 216; cymosum 45: 216; macrantherum 45: 216; rivulare 45: 216, f. rivulare 45: 216, f. glandulosum 45: 216
- Monolena 45: 236; ovata 45: 236
- Monopanax 46: 238; ghiesbrachtii 46: 238
- Moschkowitzia 45: 41
- Mouriri 45: 302; brunneicalyx 45: 304; completens 45: 304; parvifolia 45: 304; Murucuja 45: 1

INDEX, FLORA OF PANAMA, PART VII

- Myrcia 45: 166†, 172; subg. *Aulomyrcia* 45: 170; *aromatica* 45: 167; *carnea* 45: 175†; *costaricensis* 45: 173, 175†; *coumeta* 45: 173; *gatonensis* 45: 175; *oerstedeana* 45: 175†; *plicato-costata* 45: 175†; *seleriana* 45: 182; *tomentosa* 45: 172
- Myrcianthes 45: 179
- Myrciaria 45: 166†, 177; *floribunda* 45: 177, 185†; *o'neillii* 45: 177; *vismeaefolia* 45: 179
- Myriophyllum 45: 223†
- Myrobalanifera 45: 153
- Myrobalanus 45: 153; *buceras* 45: 157; *obovatus* 45: 155
- Myrrhidendron 46: 243; *maxonii* 46: 245
- Myrtaceae 45: 165; subg. *Eugenioidae* 45: 166†; subg. *Myrcioidae* 45: 166†
- Myrtopsis 45: 180
- Myrtus 45: 184†; *biflora* 45: 184; *communis* 45: 165†; *fragrans* 45: 182; *maritima* 45: 189; *salutaris* 45: 196; *samaragnensis* 45: 177
- Nephromischus 45: 41
- Nepsera 45: 226; *aquatica* 45: 227
- Nimmoia 45: 98
- Nopalea 45: 68†, 72; *cochenillifera* 45: 74; *dejecta* 45: 72†, 74
- Nordmannia 45: 94
- Nostoc 45: 223†
- Nothopanax 45: 224†
- Odostelma 45: 1
- Oenothera 46: 212; *ascendens* 46: 213; *cuprea* 46: 213; *epilobiifolia* 46: 213; *hirta* 46: 203; *laciniata* var. *pubescens* 46: 214; *latiflora* 46: 213; *multicaulis* var. *tarquensis* 46: 213; *nyctaginifolia* 46: 214; *octovalvis* 46: 205; *psycrophila* 46: 214; *pubescens* 46: 214; *purpurea* 46: 214; *rosea* 46: 214, var. *parvifolia* 46: 214; *rubra* 46: 214; *steubelii* 46: 214; *tarquensis* 46: 213; *tetraptera* 46: 213, var. *immutabilis* 46: 213; *virgata* 46: 214
- Oldenlandia 46: 195
- Olythia 45: 179
- Onagraceae 46: 195
- Opa 45: 175
- Opanea 45: 179
- Opuntia 45: 68†, 75; *cochenillifera* 45: 74; *dejecta* 45: 74; *elator* 45: 75; *ficus-indica* 45: 68†, 75†; *phyllanthus* 45: 83; *tuna* 45: 75†
- Oreopanax 46: 238; *capitatus* 46: 240; *costaricensis* 46: 242; *destructor* 46: 240; *echinops* 46: 239†; *liebmanni* 46: 239; *loeserianus* 46: 238; *microcephalum* 46: 239; *meiocephalum* 46: 239; *oligocarpum* 46: 239; *taubertianum* 46: 238; *thibautii* 46: 238; *vestitus* 46: 240; *xalapensis* 46: 238, var. *laxiflorum* 46: 238, var. *spiciforme* 46: 238
- Ortiga 45: 36
- Ossaea 45: 262; *disparilis* 45: 282; *diversifolia* 45: 264; *micrantha* 45: 264; *trichocalyx* 45: 264
- Ossea 46: 256
- Oxydiastrium 45: 180
- Pamea 45: 153
- Panax 45: 226; *morototoni* 46: 226; *speciosum* 46: 226
- Panel 45: 153
- Panke 46: 221
- Pankeia 46: 221; *insignis* 46: 223
- Papaya 45: 26; *sativa* 45: 26; *vulgaris* 45: 26
- Parsonsia 45: 104; *calophylla* 45: 108; *epilobifolia* 45: 107; *pinto* 45: 109; *utriculosa* 45: 105
- Passiflora 45: 1, 2†; *acerifolia* 45: 15; *adenophylla* 45: 17; *adenopoda* 45: 15; *alba* 45: 17; *ambigua* 45: 19; *angustifolia* 45: 12; *apetala* 45: 8; *appendiculata* 45: 11; *aspera* 45: 15; *atomaria* 45: 17; *auriculata* 45: 11; *balansae* 45: 21; *baraquiniana* 45: 21; *bicarnis* 45: 14; *biflora* 45: 7; *brighami* 45: 7; *calliaquatica* 45: 13; *capsularis* var. *geminiflora* 45: 5, var. *geminifolia* 45: 5†; *cayaponioides* 45: 11; *ceratosepala* 45: 15; *ciliata* 45: 21; *cinerea* 45: 11; *clypeata* 45: 10; *coriacea* 45: 10; *cryptopetala* 45: 11; *cyathophora* 45: 11; *difformis* 45: 10; *discolor* 45: 9; *dispar* 45: 19; *divaricata* 45: 14; *edulis* 45: 2†; *flexuosa* 45: 13; *floribunda* 45: 5; *foetida* 45: 21, var. *isthmia* 45: 22†; *glabra* 45: 12; *glabrata* 45: 7; *globosa* 45: 13; *gossypifolia* 45: 21; *gracilimma* 45: 4, 5†; *guatemalensis* 45: 9; *hahnii* 45: 9; *hastata* 45: 21; *hederacea* 45: 12; *hederaefolia* 45: 12; *heterophylla* 45: 12; *hibiscifolia* 45: 21; *hirsuta* 45: 12; *hispida* 45: 21; *holosericea* 45: 11; *incana* 45: 20; *isotriloba* 45: 5; *kegeliana* 45: 11; *kohautiana* 45: 13; *lancearia* 45: 7; *laticaulis* 45: 9; *liebmanni* 45: 21; *ligularis* 45: 18; *limbata* 45: 13; *lineariloba* 45: 13; *litoralis* 45: 12; *longifolia* 45: 12; *longilobis* 45: 9; *lunata* 45: 7, var. *costata* 45: 7; *macroceps*

INDEX, FLORA OF PANAMA, PART VII

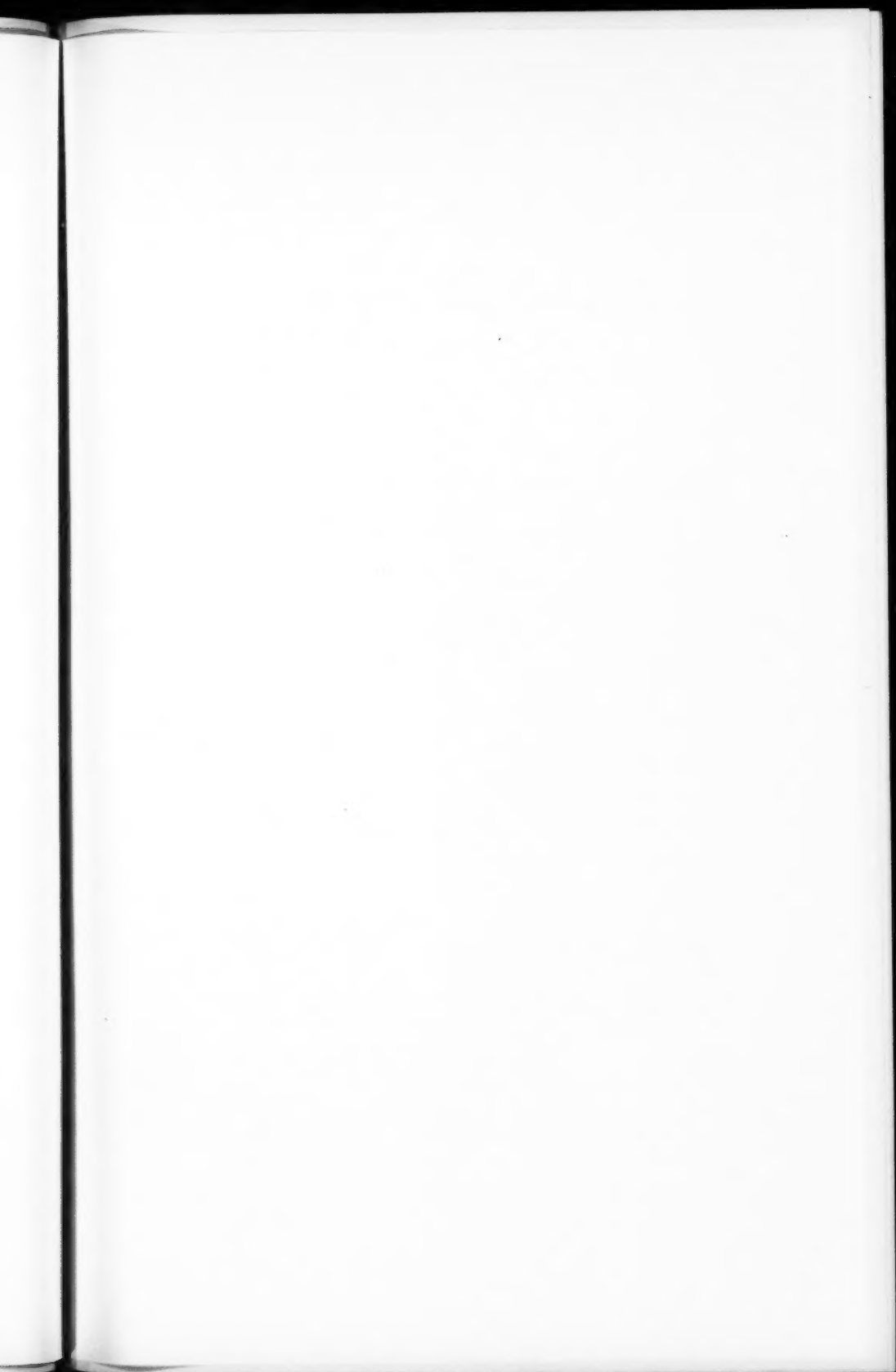
- 45: 18; maximiliana 45: 9; membranaceae 45: 14; menispermifolia 45: 17; microcarpa 45: 9; minima 45: 12; miraflorensis 45: 5; misera 45: 9; mollis 45: 8†; moritziana 45: 21; muralis 45: 21; nigelliflora 45: 21; nigra 45: 12; nitida 45: 20; nymphaeoides 45: 20; obtusifolia 45: 10; oerstedii 45: 19; oliviformis 45: 12; orbifolia 45: 20; pallida 45: 12; panamensis 45: 8; pan-nosa 45: 5; parviflora 45: 12; pediculata 45: 12; peltata 45: 12; populifolia 45: 19; pseudociliata 45: 21; pseudosuberosa 45: 13; puberula 45: 13; pulchella 45: 14, var. bifidata 45: 14; punctata 45: 9; punicea 45: 15; puppusii 45: 19; quadrangularis 45: 2†, 18; retusa 45: 9; rohrii 45: 11; rotundifolia 45: 14, var. jacquinii 45: 14; sanguinea 45: 15; seemannii 45: 20; serratistipula 45: 18; serrulata var. pubescens 45: 15; servitensis 45: 15; sexflora 45: 5; sexocellata 45: 10; spathulata 45: 7; suberosa 45: 12, var. angustifolia 45: 13, var. divaricata 45: 13, var. hederacea 45: 13, var. hirsuta 45: 13, var. lineariloba 45: 13, var. longiloba 45: 13, var. longipes 45: 13, var. minima 45: 13, var. pallida 45: 13; pe'tata 45: 17; talamancensis 45: 7; tetragona 45: 18; torta 45: 11; trans-linearis 45: 9; transversa 45: 7; tri-dactylites 45: 13; triflora 45: 5; tryphos-temmatoides 45: 4, 5†; vesicaria 45: 21; vespertilio 45: 9; villosa 45: 13, 17; vitifolia 45: 15, 16†; warei 45: 13; wil-liamsii 45: 16
- Peireskia 45: 69; foetens 45: 70
- Pekea 45: 125
- Pentacrypta 46: 245; atropurpurea 46: 245
- Pentaptera 45: 153
- Pentaria 45: 1
- Peplis occidentalis 45: 100
- Peremis 45: 1
- Pereskia 45: 68†, 69; aculeata 45: 70, β longispina 45: 70; bleo 45: 72; fragrans 45: 70; godseffiana 45: 70; grandifolia 45: 72†; longispina 45: 70; panamensis 45: 72; pereskia 45: 70; undulata 45: 70
- Pericodia 45: 1
- Perpersum 46: 221
- Petsermannia 45: 41
- Phyllocactus 45: 82; costaricensis 45: 86; gaillardae 45: 83; lepidocarpus 45: 85; macrocarpus 45: 86; macropterus 45: 86; phyllanthus 45: 83; pittieri 45: 85; thomasianus 45: 86
- Phyllocalyx 45: 179
- Phyllocereus 45: 82
- Pilderia 45: 41
- Pileus 45: 23
- Pimenta officinalis 45: 166†
- Pimpinella leptophylla 46: 247
- Pirigara 45: 117, 118†, 122; hexapetala 45: 118†; superba 45: 120
- Platycentrum 45: 41
- Platyclinum 45: 41
- Poggendorffia 45: 1
- Pogonorrhynchus amplexans 45: 284
- Poivrea 45: 144; alternifolia 45: 152; eriopetalum 45: 152
- Polyanthea 45: 1
- Pontopidiana 45: 125
- Pseudogunnera 46: 221
- Pseudorhipsalis 45: 87, 88†; alata 45: 88†; himantoclada 45: 88
- Pseudoeugenia 45: 180
- Psidiastrum 45: 180
- Psidium 45: 166†, 190†, 196; araca 45: 201; ciliatum 45: 196; friedrichsthali-anum 45: 200; gentlei 45: 196; guajava 45: 200; guineense 45: 201; molle 45: 201; polycarpon 45: 201; pomiferum 45: 200; pyrifera 45: 200; oerstedeanum 45: 196; salutare 45: 196; sartorianum 45: 198; solisii 45: 198
- Psilanthus 45: 1
- Pritzelia 45: 41
- Prosanerpis panamensis 45: 255
- Pterogastra cupheoides 45: 225
- Pterolepis 45: 231; oerstedii 45: 233; pumila 45: 232
- Putzeysia 45: 41
- Quartinia 45: 98
- Quirina 45: 98
- Quisqualis 45: 143†, 144†; indica 45: 143†, 144†
- Rachia 45: 41
- Raimannia 46: 212; colimae 46: 214; con-fusa 46: 214
- Rathea 45: 1
- Reichenheimia 45: 41
- Resinaria 45: 153
- Reynoldsia americana 46: 225
- Rhexia inaequilateralis 45: 219; limnobios 45: 231; longifolia 45: 234; pumila 45: 232; recurva 45: 230; uniflora 45: 230
- Rhizophora 45: 137; americana 45: 137; brevistyla 45: 139†, 140; mangle 45:

INDEX, FLORA OF PANAMA, PART VII

- 137, var. samoensis 45: 139; racemosa 45: 140; samoensis 45: 139
- Rhizophoraceae 45: 136
- Rhipsalis 45: 68†, 89, 91†; ser. Floccosae 45: 91†; aculeata 45: 91†; cassutha 45: 91†; cassutha 45: 89†, 91; himantoclada 45: 88; parasitica 45: 91; phyllanthus 45: 83; sp. 45: 91
- Rhizaeris 45: 162; alba 45: 162
- Rhyacophila 45: 98
- Rhynchanthera 45: 217; mexicana 45: 218; paludicola 45: 218
- Richaëia 45: 140
- Richea 45: 140
- Richeia 45: 140
- Riessia 45: 41
- Rinorea 45: 131†
- Rossmannia 45: 41
- Rotala 45: 98; apetalá 45: 100; mexicana 45: 100, subsp. hierniana 45: 100, subsp. pusilla 45: 100, subsp. typica 45: 100, subsp. typica var. α f. major 45: 100, typica var. α f. media 45: 100, subsp. typica var. α f. minima 45: 100; subsp. typica var. chamissoana 45: 100, subsp. typica var. spruceana 45: 100, β spruceana 45: 100; pusilla 45: 100; ramosior 45: 100, var. dentifera 45: 100, var. interior 45: 100; verticillaris 45: 100
- Rudbeckia 45: 161
- Sagraea epiphytica 45: 255
- Sanicula 46: 247, 248†; liberta 46: 248; mexicana 46: 248
- Sassea 45: 41; columnaris 45: 61; glabra 45: 61; hoffmanniana 45: 61; urticae 45: 61
- Saueria 45: 41
- Schoenobiblus 45: 95; ellipticus 45: 96†; panamensis 45: 96, 97†; peruviana 45: 97†
- Schefflera 46: 234; arborea 46: 230; epiphytica 46: 235; robusta 46: 237; samydifolia 46: 230; seibertii 46: 237; systyla 46: 235
- Scheidweileriá 45: 41
- Schizocentron 45: 223
- Schousboea 45: 144; coccinea 45: 150; commutata 45: 162
- Schufia 46: 218; arborescens 46: 218
- Schwackaea 45: 224; cupheoides 45: 224
- Sciadodendron 46: 224; excelsum 46: 225
- Sciadophyllum 46: 234; capitatum 46: 230, 240; jacquini 46: 230; robustum 46: 237; systylum 46: 235; samydifolium 46: 230
- Sciadophyllum 46: 234; arboreum 46: 230
- Sclerothrix 45: 32†
- Seguiera 45: 145
- Selenicereus inermis 45: 82†
- Semibegoniella 45: 42
- Sheadendron 45: 145
- Silene 45: 104
- Sison ammi 46: 247
- Spallanzania 45: 117
- Spananthe 46: 251; angulosa 46: 251; paniculata 46: 251; setosa 46: 251
- Spennera rostellata 45: 228
- Sphendanthra 45: 41
- Sphenocarpus 45: 162
- Steineria 45: 41
- Stenocalyx 45: 179; michelii 45: 182
- Stibadotheca 45: 41; trachyptera 45: 61
- Stiradotheca 45: 41†; trachyptera 45: 61
- Strephonema 45: 143†
- Suarda 45: 179
- Suffrenia 45: 98
- Suzygium 45: 166
- Svida 46: 254
- Syllisium 45: 179
- Synactila 45: 1
- Syzygium 45: 175, 180†; jambos 45: 176; malaccense 45: 176; samaragnense 45: 176
- Tacsonia 45: 1; buehanani 45: 15; sanguinea 45: 15
- Tanibouca 45: 153
- Teichmeyeria 45: 117
- Tephrocactus 45: 75
- Terminalia 45: 143†, 144†, 152†, 153, 157†; amazonia 45: 144†, 155; buceras 45: 157; cacoucia 45: 150; catappa 45: 143, 155†; chiriquensis 45: 155; erecta 45: 161; hayesii 45: 155; hilariana 45: 159; obovata 45: 155, 159; odontoptera 45: 155; spinosa 45: 159
- Thymelaeaceae 45: 93
- Tibouchina 45: 233; bipenicillata 45: 234; longifolia 45: 234; nana 45: 234; oerstedii 45: 233; paludicola 45: 218
- Tita 45: 140
- Tittelbachia 45: 41
- Tococa 45: 275, 279†; guyanensis 45: 277
- Topobea 45: 243; cooperi 45: 245; cordata 45: 244; elliptica 45: 244;

INDEX, FLORA OF PANAMA, PART VII

- membranacea **45: 247**; micrantha **45: 301**; pluvialis **45: 245**; praecox **45: 246**; regeliana **45: 246**, 247†; urophylla **45: 245**
- Torreyia **45: 32**
- Trachelanthus **45: 41**
- Trachelocarpus **45: 41**
- Trachyphytum **45: 32**
- Trendelenburgia **45: 41**
- Trilomisa **45: 41**
- Triolena **45: 236†, 238**; hirsuta **45: 239**
- Tripsilina **45: 1**; foetida **45: 21**
- Ugni **45: 166†, 194**; warszewiczii **45: 194**
- Umbelliferae **46: 242**
- Vasconcellea **45: 26**
- Vicentia **45: 153**
- Wageneria **45: 41**; deflexa **45: 54**; glabra **45: 54**; lucida **45: 54**; montana **45: 54**; moritziana **45: 54**
- Wangenheimia **46: 229**
- Weberocereus **45: 81**; panamensis **45: 81, 82†**
- Weihea **45: 140**
- Weilbachia **45: 41**
- Winterlia **45: 98**
- Wittia **45: 87, 88†**; amazonica **45: 88†, 89†**; costaricensis **45: 88**; himantoclada **45: 88**; panamensis **45: 88, 89†**
- Xerogona **45: 1**
- Xylopleurum **46: 212**; roseum **46: 214**; tetrapterum **46: 213**



Ac
Ac
Ac
Ac
Ac
Ad
Ad
Ad

Ag
Ag
An
An
An

Am
An
An
An
An
Ar
Ar
Ar
As
As
As
Au
Au

GENERAL INDEX TO VOLUME XLV

New scientific names of plants and the final members of new combinations are printed in **bold-face** type; synonyms and page numbers having reference to figures and plates, in *italics*; and all other matter, in ordinary type.

A

Acanthocereus, 76; *pentagonus*, 76, 77
Acca, 196
Aciotis, 227; *levyana*, 227, 228; *purpurascens*, 228; *rostellata*, 228
Acisanthera, 229; *limnobios*, 231; *quadrata*, 229, 230; *recurva*, 230; *uniflora*, 230
Acrolasia, 32; *squalida*, 34
Adamarum, 153
Adelobotrys, 205; *adscendens*, 206, 207
Adenaria, 112; *floribunda*, 113, 114, var. *a.*, 114, var. *australis*, 114, var. *microphylla*, 114, var. *parvifolia*, 114; *grisleooides*, 114; *lanceolata*, 114; *parviflora*, 114; *purpurata*, 114
Aetia, 144
Aguava, 172
Ameletia, 98
Ammannella, 101
Ammannia, 101; *catholica*, 100, 102; *coccinea*, 101, subsp. *longifolia*, 102, subsp. *robusta*, 102; *dentifera*, 100; *bastata*, 102; *humilis*, 100, 102; *latifolia*, 102, 103; *lingulata*, 102; *lythrifolia*, 102; *monoflora*, 100; *occidentalis*, 100; *octandra*, 102; *pallida*, 102; *pubiflora*, 102; *purpurea*, 101; *pygmaea*, 100; *sagittata*, 102; *sanguinolenta*, 102, subsp. *longifolia*, 102, subsp. *purpurea*, 102, subsp. *robusta*, 102; *stylosa*, 102; *texana*, 102, *ramosa*, 100, *ramosior*, 100, 101, 102; *robusta*, 102
 Amshoff, G. J. H.: *Myrtaceae* of Panama, 165
Ananomis, 180; *fragrans*, 182
Anthactinia, 1
Antherylium floribundum, 114; *grisleooides*, 114; *purpuratum*, 114
Anstrutheria, 140
Aristotelia, 153
Arthrostemma, 220; *alatum*, 222; *campanulare*, 222; *macrodesmum*, 221, 222
Asophora, 137
Astephananthes, 1
Astrophea, 1
Augustia, 41
Aulacocarpus completens, 304
Aulomyrcia, 170; *coumeta*, 173; *tomentosa*, 171, 172; *zetekiana*, 170

Axinaea, 209; *costaricensis*, 209, 210

B

Badamia, 153
Baldwinia, 1; *peltata*, 12
Balsamona, 104; *pinto*, 109.
Bartonia, 32
Barya, 41
Begonia, 41; *allenii*, 62; *barbana*, 49; *brevicyma*, 52, 53; *broussonetiiifolia*, 60; *carletonii*, 48; *carpinifolia*, 65, 66; *caudilimba*, 45; *chebpoensis*, 56; *chiriquensis*, 61; *chiriquina*, 66; *ciliibracteola*, 57; *coccinea*, 61; *columnaris*, 61, var. *glabra*, 61; *conchifolia*, 43, 44; *convallariodora*, 65, 67; *cucullata*, 61; *cuspidata*, 60; *daedalia*, 49; *davidsoniae*, 52, 53; *deryciana*, 45; *elliptica*, 54; *estrellensis*, 64; *filipes*, 55, 56; *fischeri* var. *tovarensis*, 55, 57; *flexuosa*, 56; *garagarana*, 46, 47; *glabra*, 54, 55; *glabra*, 61; *glandulosa*, 46; *guadensis*, 64, 65; *guyanensis*, 56, var. *glaberrima*, 56; *heterodonta*, 56; *heydei*, 59, 62; *hygrophila*, 56, var. *puberula*, 56; *involutocrata*, 59, 60; *laciniosa*, 60; *laurina*, 64; *leptopoda*, 56; *locellata*, 54; *lucida*, 54; *luxii*, 58; *mameiana*, 56; *monticola*, 61; *moritziana*, 54, 57; *mucronistipula*, 52, 53; *multinervia*, 59, 60; *nelumbiifolia*, 44; *oaxacana*, 58, 59, *β pilosula*, 58; *opuliflora*, 63; *ottonis*, 64; *physalifolia*, 54; *pittieri*, 62; *plebeja*, 45, 46; *populifolia*, 57; *pubipedicella*, 58; *pumilio*, 43; *quaternata*, 47; *rosea*, 56; *scandens*, 54; *scutellata*, 43; *seemaniana*, 65, 66; *semiovata*, 55, 56; *serratifolia*, 64; *serrulatoala*, 58; *spruceana*, 56; *squarrosa*, 50; *stigmosa*, 50; *strigillosa*, 49, 50; *tonduzii*, 59, 62; *torresii*, 61; *tovarensis*, 57, *β ocanensis*, 57; *trachyptera*, 61; *triloba*, 62; *udisilvestris*, 58, 59; *urticae*, 61; *urticifolia*, 61; *uvana*, 46; *vestita*, 51, 52; *villipetiola*, 48, 49; *walpersii*, 64
Begoniaceae of Panama, 41
Begoniella, 42
Bellucia, 258; *costaricensis*, 258, 259
Bergena, 127
Bergenia, 104
Bertolonia hirsuta, 239

Besseyia, 306

Blakea, 239; brunnea, 242; calycosa, 241; crinita, 241; foliacea, 242; gracilis, 242; parviflora, 243; pauciflora, 243; woodsonii, 240, 241

Rhepistemma, 1

Boykinia, 98; humilis, 100

Buceras, 157; bucida, 157

Buchenavia, 159; capitata, 158, 159

Bucida, 157; buceras, 156, 157; capitata, 159

Bureava, 145

C

Cacoucia, 144; coccinea, 150

Cactaceae of Panama, 68

Cactus bleo, 72; cochenillifer, 74; elatior, 75; lucidus, 70; nigricans, 75; pendulus, 91; pentagonus, 76; pereskia, 70; phyllanthus, 83; pitajaya, 76; prismaticus, 76; tuna β elatior, 75, γ nigricans, 75

Calophylloides, 179

Calophysa setosa, 254; tococoidea, 254

Calycampe, 172

Calycolpus, 192; parviflorus, 196; warzewiczianus, 193, 194

Calyplectus, 110

Calyptbranthus, 166

Calyptranthes, 166; chytraculia, 168, 169; costaricensis, 169; hylobates, 169; pittieri, 167; schiedeana, 167; schlechtendaliana, 167; tonduzii, 198; tumidonodia, 167; urophylla, 167

Calyptranthus, 166

Calyptrella, 212; micrantha, 213, 214

Calyptropsidium, 196; friedrichsthalianum, 200; sartorianum, 198

Camphylobiton, 145

Carica, 26; chiriquensis, 30, 31; eueurbitifolia, 29; dolichaula, 23; hermaphrodita, 26; mamaja, 26; papaya, 26, 27

Caricaceae of Panama, 22

Carpophyllus, 69

Casparya, 41; coccinea, 61; columnaris, 61, β glabra, 61; trachyptera, 61; urticae, 61, β hispida, 61

Cassipourea, 140; alba, 142; cubensis, 142; elliptica, 141, 142, β alba, 142, γ pauciserrata, 142; macrodonta, 142; podantha, 142

Catappa, 153

Catinga, 179

Centradenia, 218; inaequilateralis, 219; maxoniana, 219, 220

Centronia, 212; grandiflora, 212; tomentosa, 211, 212

Ceratosepalum, 1; micranthum, 15

Cereus subsect. *Acanthocereus*, 76; subgenus *Hylocereus* 78; acutangulus, 76; costaricensis, 80; dussii, 76; monacanthus, 80; nitidus, 76; pentagonus, 76; phyllanthus, 83; pitajaya, 76; polyrhizus, 80; princeps, 76; prismaticus, 76; sirul, 76; trigonus var. costaricensis, 80; variabilis, 76; vasmeri, 76

Cerocarphus, 179

Chaetolepis nana, 234

Chichbarronia, 153

Chloromyrtus, 180

Chrysostachys, 145; ovatifolia, 151

Chrysostoma, 32

Chunchoa obovata, 155

Chunchoa, 153; amazonia, 155; obovata, 155

Chytraculia, 166

Cytralia, 166

Cieca, 1; angustifolia, 13; appendiculata, 11; auriculata, 11; cinerea, 11; coriacea, 10; difformis, 10; discolor, 9; flexuosa, 13; glabrata, 7; globosa, 13; lederacea, 13; heterophylla, 12; limbata, 13; litoralis, 13; membranacea, 14; minima, 12, 13; misera, 9; nigra, 12; olivaeformis, 13; pallida, 13; pannosa, 5; peltata, 13; pseudo-suberosa, 13; suberosa, 12; viridis, 12; warei, 13

Cladomischus, 41

Clidemia, 247; barbinervis, 289; capitellata, 252; collina, 253; densiflora, 255; dentata, 250; dependens, 252; deppeana, 253; dichotoma, 266; epiphytica, 255; gracilis, 248; hirta, 251; melanodesma, 266; melanotricha, 301; neglecta, 252; novemnervia, 251; oblonga, 250; ombrophila, 256; pittieri, 249, 250; purpureo-violacea, 256; reitziana, 253; rubra, 255; setosa, 254; strigillosa, 251; subseriata, 266; taurina, 254; tococoidea, 254

Clidemiastrum mexicanum, 265

Coleophora, 94

Combretaceae of Panama, 143

Combretum, 144; sect. Cacoucia, 145; sect. Combretastrum, 145; sect. Eucombretum, 145; sect. Spinosa, 145; accedens, 151; adenophyllum, 151; alternifolium, 152; aurantiacum, 147; benthamianum, 147; brunnescens, 151; bugi, 151; cacoucia, 146, 150; coccineum, 150; cordatum, 150; decandrum, 146, 152; epiphyticum, 151; eriopetalum, 152; farinosum var. phaenopetalum, 147; ferrugineum, 150, 151; formosum, 147; fruticosum, 146, 147, 148; gloriosum, 147; guayca, 152; jacquinii, 151; latepaniculatum, 152; laxum, 146, 150; laxum, 147; lepidopetalum, 147; loeflingii, 147, subsp.

- ornithophilum*, 147; *marcbii*, 151; *micropetalum*, 147; *multidiscum*, 147; *nicoyanum*, 152; *oblongifolium*, 151; *obtusifolium*, 150; *occidentale*, 147; *odoratissimum*, 151; *odoratum*, 150; *palmeri*, 152; *phaenopetalum*, 147; *puberum*, 150; *pulchellum*, 151; *punctulatum*, 152; *sambuense*, 149; *secundum*, 147; *spinosum*, 146, 152; *superbum*, 147; *terminalioides*, 151; *variabile*, 151; *viscidum*, 151; *warszewiczianum*, 147
Conocarpus, 161; *acutifolius*, 161; *erectus*, 160, 161, var. *arboreus*, 161, var. *procumbens*, 161; *procumbens*, 161; *pubescens*, 161; *racemosus*, 162; *supinus*, 161
Conostegia, 269; *bracteata*, 271; *hirsuta*, 270; *chiriquensis*, 275; *excelsa*, 209; *lanceolata*, 271; *macrantha*, 270; *micrantha*, 275; *micromeris*, 273; *montana*, 274; *oerstediana*, 270; *polyandra*, 273; *puberula*, 273; *setosa*, 270; *sororia*, 273; *speciosa*, 271, 272; *subcrustulata*, 274; *xalapensis*, 271
Consolia, 75
Copaifera fissicuspis, 340; *hemitomophylla*, 325
Cornelia, 101
Couratari, 134; *panamensis*, 134, 135
Couroupita, 125; *cutteri*, 125; *dariensis*, 125; *guianensis*, 125, 126; *nicaraguensis*, 125; *odoratissima*, 125; *parviflora*, 125
Creolobus, 32
Cristaria, 144
Cryptophysa setosa, 270
Cryptotbeca, 101
Cuphea, 104; *antisiphilitica*, 108; *appendiculata*, 110; *balsamona*, 101; *calophylla*, 108, var. *calophylla*, 108, var. *microstyla*, 108, var. *orthodisca*, 108; *carthagensis*, 109; *elliptica* var. *a*, 109; *epilobifolia*, 108, var. *caquetae*, 107, var. *costaricensis*, 107, var. *venezuelana*, 107; *gracilis*, 105; *infundibulum*, 110, var. *foliosa*, 110; *microstyla*, 108; *orthodisca*, 108; *panamensis*, 105; *plumbaginea*, 108; *rigidula*, 105; *setosa*, 105, var. *a*, 105, *glabrescens*, 105; *utriculosa*, 105, 106, var. *a*, 105, var. *donnell-smithii*, 105, var. *panamensis*, 105
Cyatbocnemis, 41
Cynometra, The New World Species of, 313
Cynometra: economic importance, 318; generic relationships, 313; geographical distribution, 318; history of the genus, 313; interspecific relationships, 318; key to spp., 320; morphological characteristics, 315
Cynometra, 319; sect. *Comatovaria*, 320; sect. *Guiana*, 320; sect. *Nummus*, 320; *americana*, 321; *bauhiniaefolia*, 336, var. *bauhiniaefolia*, 337, var. *grandiflora*, 338, var. *meridiana*, 338; *colimensis*, 329; *crassifolia*, 330; *cubensis*, 322; *cuneata*, 331; *duckei*, 336; *fissicuspis*, 340, 341; *glazovii*, 342; *hemitomophylla*, 325; *hondurensis*, 326; *hostmanniana*, 339; *longicuspis*, 334; *longifolia*, 335; *marginata*, 327, var. *guianensis*, 329, var. *laevis*, 329, var. *marginata*, 329; *martiana*, 333; *microflora*, 338; *oaxacana*, 329; *obtus*, 334; *parvifolia*, 338; *phaselocarpa*, 334; *portoricensis*, 323; *racemosa*, 334; *retusa*, 324; *riedeliana*, 342; *schottiana*, 327; *sphaerocarpa*, 343; *spruceana*, 332, var. *γ macrophylla*, 333, var. *phaselocarpa*, 334, var. *β procera*, 333, var. *spruceana*, 333; *stenopetala*, 331; *trinitensis*, 325; *zamorana*, 343
D
Dactylopetalum, 140
Daphnopsis, 94; *seibertii*, 94, 95
Davya macrophylla, 209
Decaloba, 1; *bisflora*, 7, var. *major*, 7, var. *mexicana*, 7; *cyathophora*, 11; *holosericea*, 11; *jacquini*, 14; *punctata*, 9; *sexflora*, 5
Diolena, 236; *spicata*, 236
Dipetalon, 104
Diploclinum, 41
Diplostemon, 101
Disemma, 1
Distemma, 1
Distephana, 1
Distephania, 1
Distephia, 1
Ditbeca, 101
Donaldia, 41; *ottonis*, 64
Doratometra, 41
Dwyer, John D.: The New World Species of *Cynometra*, 313
Dysosmia, 1; *acerifolia*, 15; *ciliata*, 21; *fluminensis*, 21; *foetida*, 21; *gossypifolia*, 21; *hastata*, 21; *hibiscifolia*, 21; *nigelliflora*, 21
E
Elsboltzia, 125
Embryogonia, 145
Endecaria, 104
Epiphyllum, 82; *costaricense*, 86; *gaillardae*, 83; *gigas*, 87; *lepidocarpum*, 85; *macropterum*, 86; *phyllanthus*, 83, 84; *pittieri*, 85; *thomasianum*, 86
Epleianda, 179

Erndelia, 1

Eschweilera, 130; *calyculata*, 133; *garagarae*, 133; *panamensis*, 130; *pittieri*, 131, 132; *reversa*, 130; *verruculosa*, 131

Eugenia, 179; sp., 187; *acapulcensis*, 188, 189; *alfaroana*, 181; *antiquae*, 189; *austin-smithii*, 191; *balancensis*, 187; *banghamii*, 186; *biflora*, 184; *cartagenensis*, 189; *chepensis*, 185; *chrysophyllum*, 191; *colipensis*, 189; *coloradensis*, 186; *costaricensis*, 186; *coumeta*, 173; *cricamolensis*, 191; *floribunda*, 177; *fragrans*, 182, 183; *hiraefolia*, 189; *jambos*, 176; *javanica*, 177; *malaccensis*, 176; *maritima*, 189; *melanosticia*, 186; *micheelii*, 182; *nesiotica*, 184; *ocbra*, 190; *octopleura*, 191; *oerstedeana*, 187; *o'Neillii*, 177; *oreinoma*, 192; *origanoides*, 186; *pittieri*, 185; *roraimana*, 190; *salamancana*, 190; *sericiflora*, 184; *storkii*, 182; *tapacumensis*, 190; *tomentosa*, 172; *uniflora*, 182; *vallis*, 172; *vismeaefolia*, 179; *warscewiczii*, 194; *zetekiana*, 170

Eugeniinae, 165*Eupetalum*, 41*Ewaldia*, 41

Exell, A. W.: *Combretaceae of Panama*, 143

F

Falkea, 41*Fatsea*, 153*Ficindicia*, 75*Forsgardia*, 144; *laevis*, 150

G

Gaerdia, 41*Gaura fruticosa*, 147*Gimbernatea*, 153; *obovata*, 155

Gireoudia, 41; *conchifolia*, 43; *nelumbifolia*, 45; *stigmata*, 50; *strigillosa*, 49; *warscewicziana*, 43

Gleason, H. A.: *Melastomataceae of Panama*, 203

Gonocarpus, 144; *jacquinii*, 152

Granadilla, 1; *foetida*, 21; *quadrangularis*, 18; *suberosa*, 12

Greggia, 179

Gregory, David P.: *Rhizophoraceae of Panama*, 136

Grias, 122; *fendleri*, 124; *pittieri*, 123, 124

Grislea, 144

Gronovia, 40; *scandens*, 39, 40

Guajava mollis, 201*Guapurium*, 179*Guaiava*, 196*Guibourtia fissicuspis*, 340*Gurltia*, 41

Gustavia, 117; *brachycarpa*, 119; *insignis*, 120; *nana*, 120; *pleurocarpa*, 118; *superba*, 120, 121, var. *salviniae*, 120

H

Haagea, 41*Hambergera*, 144*Hambergia*, 144*Haplocarpum*, 101*Hargasseria*, 94*Hariota*, 89; *cassytba*, 91*Heeria*, 223; *cupheoides*, 225

Henriettea, 256; *brunnescens*, 260; *succosa*, 257, 258

Henriettella, 260; *densiflora*, 255; *fascicularis*, 262; *seemani*, 261, 262; *tuberculosa*, 262

Hesperaster, 32

Heterocentron, 223; *glandulosum*, 223, 224

Heterotrichum, 277; *novemnervium*, 251; *octonum*, 277, 278

Hexacllamys, 179*Hoffmannella rosea*, 56*Horau*, 162*Hudsonia*, 159; *arborea*, 159*Huidobria*, 36*Huszia*, 41*Hydrolithrum*, 98

Hypobrichia, 98; *spruceana* var. *tenuifolia*, 100

Hylocereus, 78; *costaricensis*, 80; *monacanthus*, 79, 80; *polyrhizus*, 80

I

Irma, 41*Isnardia subbastata*, 102*Isopteryx*, 41

J

Jambosa, 175; *domestica*, 176; *malaccensis*, 176; *samaragnensis*, 177; *vulgaris*, 176

Japarandiba, 117; *superba*, 120

Jacaratia, 23; *costaricensis*, 25; *dolichaula*, 23, 24

Jossinia, 179*Jussiaea sagittata*, 102

K

Klaprothia, 34; *mentzeloides*, 35

Knesebeckia, 41*Kniphofia*, 153

L

Lafoensia, 110, *punicifolia*, 111, 112

Laguncularia, 162; *obovata*, 162; *racemosa*, 162, 163

Lasiandra bipenicellata, 234*Lauchea*, 41

Leandra, 265; *consimilis*, 268; *dichotoma*, 266; *melanodesma*, 266, 267; *mexicana*, 265; *strigosa*, 268; *subseriata*, 266; *subulata*, 268

Lecythidaceae of Panama, 115

Lecythis, 127; *ampla*, 128; *armilensis*, 128; *melliana*, 128; *tuyrana*, 128, 129

Lecythopsis, 134

Legnotis, 140; *elliptica*, 142

Lepia, 41

Loasa, 36; *bipinnata*, 36; *grandis*, 38; *rhoeadifolia*, 36; *rudis*, 36, 37; *speciosa*, 38; *triphylla* var. *rudis*, 36

Loasaceae of Panama, 32

Lomastelma, 179

Loreya, 260; *brunnescens*, 260

Ludwigia scabriuscula, 102

Lythraceae of Panama, 97

Lythrum carthagenensis, 109

M

Macrophora, 1; *sanguinea*, 15

Maieta setosa, 254; *tococoidea*, 254

Magnusia, 41

Maja, 104

Malidra, 179

Mangium, 137

Mangle, 137

Meioperis, 1; *angustifolia*, 13; *bederacea*, 13; *minima*, 13; *pallida*, 13; *pannosa*, 5; *peltata*, 13; *suberosa*, 13

Melanium, 104

Melastoma adscendens, 207; *albicans*, 292; *aquaticum*, 227; *argentea*, 287; *capitellata*, 252; *caudata*, 283; *ciliata*, 296; *diversifolia*, 264; *fascicularis*, 262; *hirtum*, 251; *holosericea*, 282; *ibaguense*, 289; *impetiolaris*, 288; *lacera*, 297; *micrantha*, 264; *montana*, 274; *mucronata*, 282; *nervosum*, 292; *octonum*, 277; *prasina*, 290; *purpurascens*, 228; *rubens*, 301; *rubiginosa*, 293; *rubra*, 255; *strigillosa*, 251; *succosa*, 258; *theaezans*, 299; *xalapense*, 271

Melastomataceae of Panama, 203

Melfona, 104

Melvilla, 104

Mentzelia, 32; *aspera*, 33, 34; *pedicellata*, 34; *stipitata*, 34

Meriania, 207; *macrophylla*, 209; *panamensis*, 207, 208

Mezierea, 41

Miconia, 279; sect. *Adenodesma*, 284; sect. *Amblyarrhena*, 297; sect. *Chaenopleura*, 301; sect. *Cremanium*, 299; sect. *Glossocentrum*, 294; sect. *Hartigia*, 296; sect. *Jucunda*, 282; sect. *Miconia*, 284; sect.

Tamonea, 283; *aeruginosa*, 286; *albicans*, 292; *amplexans*, 284; *angustispica*, 286; *argentea*, 287; *atrosanguinea*, 301; *barbinervis*, 289; *blakeaefolia*, 296; *borealis*, 294, 295; *calvescens*, 289; *caudata*, 283; *ciliata*, 296; *costaricensis*, 298; *curvipetiolata*, 296; *cuspidatissima*, 300; *darienensis*, 290; *disparilis*, 282; *gatunensis*, 283; *goniostigma*, 298; *gracilis*, 286; *holosericea*, 282; *hondurensis*, 283; *hyperprasina*, 291; *ibaguensis*, 289; *impetiolaris*, 288, var. *impetiolaris*, 288, var. *pandurifolia*, 288; *insularis*, 291; *lacera*, 297; *lateriflora*, 282; *melanotricha*, 301, var. *melanotricha*, 302, var. *panamensis*, 302; *mucronata*, 282; *nervosa*, 292; *oinochrophylla*, 296; *panamensis*, 293; *pittieri*, 300; *prasina*, 290; *pteropoda*, 290; *robinsoniana*, 296; *rubens*, 301; *rubiginosa*, 293; *rufostellulata*, 294; *schlimii*, 298; *septuplinervia*, 292; *shattuckii*, 302; *stenostachya*, 287; *subcrustulata*, 274; *theaezans*, 299; *transversa*, 296; *triplinervis*, 286

Microjambosa, 175

Mitrantes sartorianum, 198

Mitropsidium sartorianum, 198

Mitscherlichia, 41

Monactineirma, 1; *angustifolia*, 12; *coriacea*, 10; *bederacea*, 12; *minima*, 12; *peltata*, 12; *suberosa*, 12

Monochaetum, 214; *bracteolatum*, 216; *cymosum*, 215, 216; *macrantherum*, 216; *rivulare*, 216

Monolena, 236; *ovata*, 236, 237

Moschkowitzia, 41

Mouriri, 302; *brunneicalyx*, 304; *completens*, 304; *parvifolia*, 303, 304

Murucuja, 1

Myrcia, 172; subgenus *Aulomyrcia*, 170; *aromatica*, 167; *costaricensis*, 173, 174; *coumeta*, 173; *gatunensis*, 175; *oerstediana*, 175; *plicato-costata*, 175; *seleriana*, 182; *tomentosa*, 172

Myrcianthes, 179

Myrciaria, 177; *floribunda*, 177, 178; *o'neilii*, 177; *vismeaefolia*, 179

Myrciinae, 165

Myrobalanifera, 153

Myrobalanus, 153; *buceras*, 157; *obovatus*, 155

Myrtaceae of Panama, 165

Myrtinae, 165

Myrtopsis, 180

Myrtus biflora, 184; *fragrans*, 182; *martima*, 189; *salutaris*, 196; *samaragnensis*, 177

N

- Nephromiscus*, 41
Nepsera, 226; *aquatica*, 226, 227
Nevling, Lorin I.: *Lythraceae* of Panama, 97
Nimmoia, 98
Nopalea, 72; *cochenillifera*, 73, 74; *dejecta*, 74
Nordmannia, 94

O

- Odostelma*, 1
Olymbia, 179
Opa, 175
Opanea, 179
Opuntia, 75; *cocbinelifera*, 74; *dejecta*, 74; *elator*, 75; *phyllanthus*, 83
Ortiga, 36
Ossaea, 262; *disparilis*, 282; *diversifolia*, 264; *micrantha*, 263, 264; *trichocalyx*, 264
Oxydiastrium, 180

P

- Pamea*, 153
Panel, 153
Papaya, 26; *sativa*, 26; *vulgaris*, 26
Parsonsia, 104; *calophylla*, 108; *epilobifolia*, 107; *pinto*, 109; *utriculosa*, 105
Passiflora, 1; *acerifolia*, 15; *adenophylla*, 17; *adenopoda*, 15; *alba*, 17; *ambigua*, 19; *angustifolia*, 12; *apetala*, 8; *appendiculata*, 11; *aspera*, 15; *atomaria*, 17; *auriculata*, 11; *balansae*, 21; *baraquiniana*, 21; *bicornis*, 14; *biflora*, 7; *brighami*, 7; *calliaquatica*, 13; *capsularis* var. *geminiflora*, 5; *cayaponioides*, 11; *ceratosepala*, 15; *ciliata*, 21; *cinerea*, 11; *clypeata*, 10; *coriacea*, 10; *cryptopetala*, 11; *cyathophora*, 11; *difformis*, 10; *discolor*, 9; *dispar*, 19; *divaricata*, 14; *flexuosa*, 13; *floribunda*, 5; *foetida*, 21; *glabra*, 12; *glabrata*, 7; *globosa*, 13; *gossypifolia*, 21; *gracilimma*, 4; *hahnii*, 9; *bastata*, 21; *hederacea*, 12; *hederacfolia*, 12; *heterophylla*, 12; *hibiscifolia*, 21; *hirsuta*, 12; *hispidula*, 21; *holosericea*, 11; *incana*, 20; *isotriloba*, 5; *kegeliana*, 11; *kobautiana*, 13; *lancearia*, 7; *laticaulis*, 9; *liebmanni*, 21; *ligularis*, 13; *limbata*, 13; *lineariloba*, 13; *litoralis*, 12; *longifolia*, 12; *longilobis*, 9; *lunata*, 7, var. *costata*, 7; *macrocephala*, 18; *maximiliana*, 9; *membranacea*, 14; *menispermifolia*, 17; *microcarpa*, 9; *minima*, 12; *miraflorensis*, 5; *misera*, 9; *moritziana*, 21; *muralis*, 21; *nigelliflora*, 21; *nigra*, 12; *nitida*, 20; *nymphaeoides*,

- 20; *obtusifolia*, 10; *oerstedii*, 19; *oliviformis*, 12; *orbifolia*, 20; *pseudo-suberosa*, 13; *puberula*, 13; *pulchella*, 14, var. *bifidata*, 14; *punctata*, 9; *punicea*, 15; *purpurea*, 19; *pallida*, 12; *panamensis*, 8; *pannosa*, 5; *parviflora*, 12; *pediculata*, 12; *peltata*, 12; *populifolia*, 19; *pseudociliata*, 21; *quadrangularis*, 18; *retusa*, 9; *robrii*, 11; *rotundifolia*, 14, var. *jacquinii*, 14; *sanguinea*, 15; *seemannii*, 20; *serrati-stipula*, 18; *serrulata* var. *pubescens*, 15; *servitensis*, 15; *sexfloa*, 5, 6; *sexocellata*, 10; *spathulata*, 7; *suberosa*, 12; *subpelata*, 17; *talamancensis*, 7; *tetragona*, 18; *torta*, 11; *translinearis*, 9; *transversa*, 7; *tridactylites*, 13; *triflora*, 5; *tryphostemmatoides*, 4; *vesicaria*, 21; *vespertilio*, 9; *villosa*, 13; *vitifolia*, 15; *warcei*, 13; *williamsii*, 16
Passifloraceae of Panama, 1
Peireskia, 69
Pekea, 125
Peltogyne glazovii, 342; *riedeliana*, 342
Pentaptera, 153
Pentaria, 1
Peplis occidentalis, 100
Peremis, 1
Pereskia, 69; *aculeata*, 70, 71, β *longispina*, 70; *bleo*, 72; *foetens*, 70; *fragrans*, 70; *godseffiana*, 70; *longispina*, 70; *panamensis*, 72; *pereskia*, 70; *undulata*, 70
Pericodia, 1
Petermannia, 41
Phyllocactus, 82; *costaricensis*, 86; *gaillardae*, 83; *lepidocarpus*, 85; *macrocarpus*, 86; *macropterus*, 86; *phyllanthus*, 83; *pittieri*, 85; *thomasiannus*, 86
Phyllocalyx, 179
Phyllocereus, 82
Pilderia, 41
Pirigara, 117, 122; *superba*, 120
Platycentrum, 41
Platyclinium, 41
Poirrea, 144; *alternifolia*, 152; *eripetalum*, 152
Poggendorffia, 1
Pogonorrhynchus amplexans, 284
Polyanthes, 1
Pontopidiana, 125
Pritzelia, 41
Prosanerps panamensis, 255
Pseudoeugenia, 180
Pseudorbipalis, 87; *himantoclada*, 88
Psidiastrium, 179
Psidium, 196; *araca*, 201; *ciliatum*, 196; *friedrichsthalianum*, 200; *gentlei*, 196; *guajava*, 200; *guineense*, 201; *molle*, 201; *oerstedeanum*, 196; *polycarpon*, 201;

pomiferum, 200; *pyriferum*, 200; *salutare*, 196, 197; *sartorianum*, 198, 199; *solisii*, 198
Psilanthus, 1
Pterogastra cupheoides, 225
Pterolepis, 231; *oerstedii*, 233; *pumila*, 232
Putzeysia, 41

Q

Quartinia, 98
Quirina, 104
Quisqualis indica, 144

R

Rachia, 41
Rathea, 1
Reichenbeimia, 41
Resinaria, 153
Rhexia inaequilateralis, 219; *limnobios*, 231; *longifolia*, 234; *pumila*, 232; *recurva*, 230; *uniflora*, 230
Rhipsalis, 89; sp., 91; *cassutha*, 90, 91; *bimantoclada*, 88; *parasitica*, 91; *phyllanthus*, 83
Rhizaeris, 162; *alba*, 162
Rhizophora, 137; *americana*, 137; *brevistyla*, 140; *mangle*, 137, var. *samoensis*, 139; *racemosa*, 140; *samoensis*, 138, 139
Rhizophoraceae of Panama, 136
Rhyacophila, 98
Rhynchanthera, 217; *mexicana*, 217, 218; *paludicola*, 218
Richaia, 140
Richia, 140
Richeia, 140
Riessia, 41
Rosmannia, 41
Rotala, 98; *apetala*, 100; *mexicana*, 90, 100, subsp. *hierniana*, 100, subsp. *pusilla*, 100, *β spruceana*, 100, subsp. *typica*, 100; *pusilla*, 100; *ramosior*, 100, var. *dentifera*, 100, var. *interior*, 100; *verticillaris*, 100
Rudbeckia, 161

S

Sagraea epiphytica, 255
Sasaea, 41; *columnaris*, 61; *glabra*, 61; *hoffmanniana*, 61; *urticae*, 61
Saueria, 41
Scheidweileria, 41
Schizocentron, 223
Schoenobiblus, 95; *panamensis*, 96
Schousboea, 144; *coccinea*, 150; *commutata*, 162
Schubert, Bernice G., & Lyman B. Smith: *Begoniaceae* of Panama, 41
Schwackaea, 224; *cupheoides*, 224, 225

Seguiera, 145
Semibegoniella, 42
Shreadendron, 145
Silene, 104
Smith, Lyman B., & Bernice G. Schubert: *Begoniaceae* of Panama, 41
Spallanzania, 117
Spennera rostellata, 228
Sphenocarpus, 162
Sphendanthra, 41
Steineria, 41
Stenocalyx, 179; *micheelii*, 182
Stibadotheca, 41; *trachyptera*, 61
Suarda, 179
Suffrenia, 98
Suzygium, 166
Syllisium, 179
Synactila, 1
Synthyris ranunculina, 305
Synthyris, 307; distribution and variation in, 309; *ranunculina*, number of flower parts in, 311
Syzygium, 175; *jambos*, 176; *malaccense*, 176; *samaragnense*, 176

T

Tacsonia, 1; *buchanani*, 15; *sanguinea*, 15
Tanibouca, 153
Teichmeyeria, 117
Tephrocactus, 75
Terminalia, 153; *amazonia*, 155; *buceras*, 157; *cacoucia*, 150; *chiriquensis*, 154, 155; *erecta*, 161; *bayesii*, 155; *bilariana*, 159; *obovata*, 155, 159; *odontoptera*, 155
Thymelaeaceae of Panama, 93
Tibouchina, 233; *bipenicellata*, 234; *nana*, 234; *oerstedii*, 233; *longifolia*, 234, 235; *paludicola*, 218
Tita, 140
Tittelbachia, 41
Tococa, 275; *guyanensis*, 276, 277
Topobea, 243; *cooperi*, 245; *cordata*, 244; *elliptica*, 244; *membranacea*, 247; *micrantha*, 301; *pluvialis*, 245; *praecox*, 246; *regeliana*, 246; *urophylla*, 245
Torreya, 32
Trachelanthus, 41
Trachelocarpus, 41
Trachylobium martianum, 333
Trachyphytum, 32
Trendelenburgia, 41
Trilomisa, 41
Triolena, 238; *hirsuta*, 238, 239
Tripsilina, 1; *foetida*, 21

U

Ugni, 194; *warscewiczii*, 194, 195

V

Vicentia, 153*Vouapa phaselocarpa*, 334

W

Wageneria, 41; *deflexa*, 54; *glabra*, 54;
lucida, 54; *montana*, 54; *moritziana*, 54*Weberocereus*, 81; *panamensis*, 81, 82*Weihea*, 140*Weilbachia*, 41Went, F. W.: *Synthyris ranunculina*, 305*Winterlia*, 98*Wittia*, 87; *costaricensis*, 88; *himantoclada*,
88; *panamensis*, 88, 89

X

Xerogona, 1

2